

Autodata Nine Operation Installation Maintenance Manual, Printed 1975
Digital Printer, Technical Guide

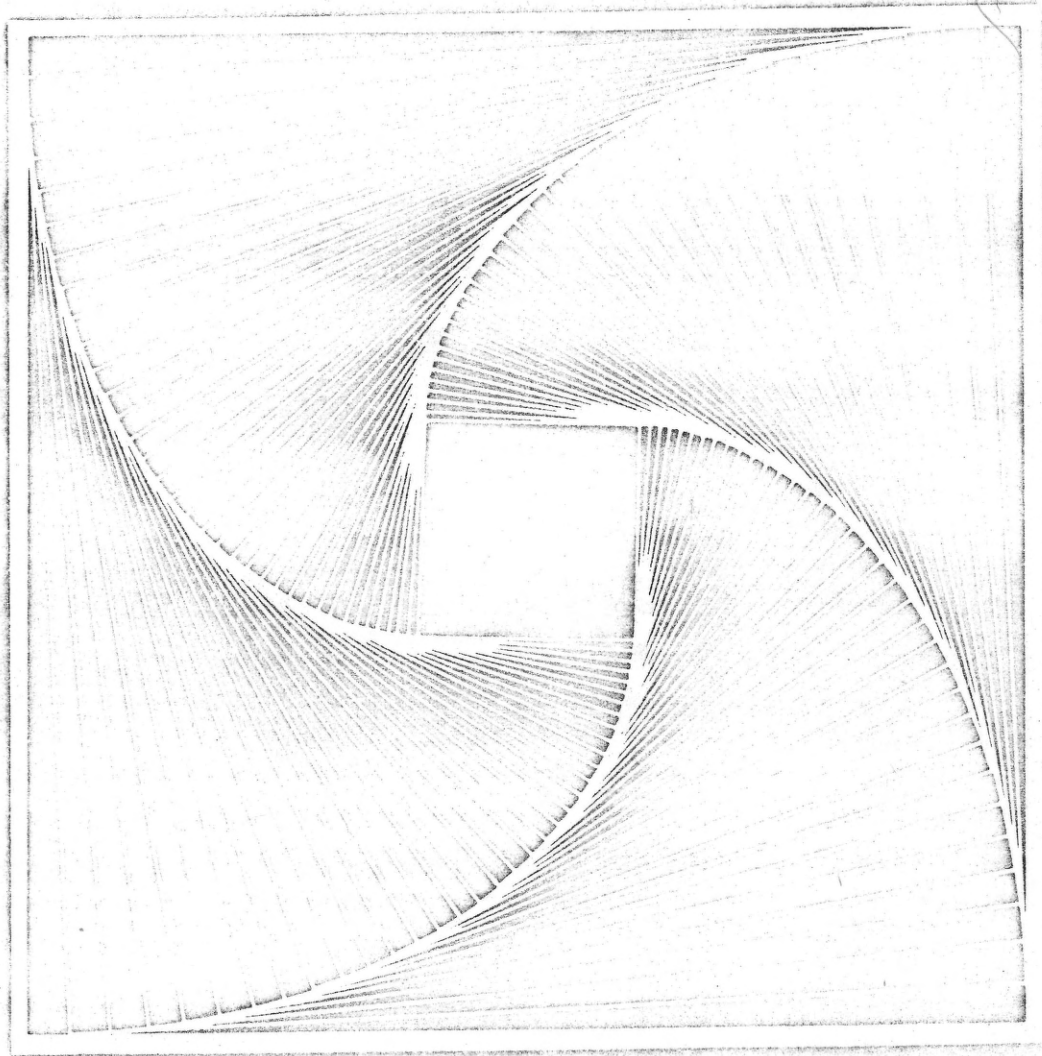
ACUREX AUTODATA
SIETRO

DIGITAL PRINTER

TECHNICAL GUIDE

VOLUME

2



SEIKO

DIGITAL PRINTER

MODEL-102 (18 COLUMNS)

MODEL-102W (20 COLUMNS)

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I SPECIFICATIONS

Note: *mark shows MODEL-102W.

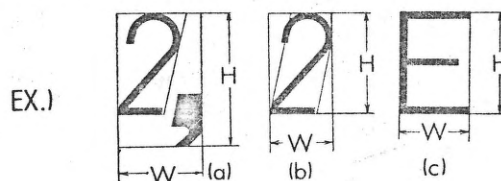
Digital Printer MODEL-102 & 102W operate at $15 \pm 2V$ DC in a temperature range from $0^{\circ}C$ ($+32^{\circ}F$) to $+50^{\circ}C$ ($+122^{\circ}F$).

1. **Print Cycle Time** : 375msec approximately (Black Print)
400msec approximately (Red Print)
2. **Column Capacity** : Up to 18 (*20) columns
3. **Characters** : Up to 13 positions, numerals 0 through 9, and other symbols are available on special orders.
Note: Comma is possible to be over-printed, but it cannot be printed overlaps with the neighbouring character.
4. **Data Entry** : Parallel (all columns)
5. **Character Spacing** : Column spacing $2.54mm$ ($1/10''$) $\pm 5\%$
Line spacing $4.24mm$ ($1/6''$) $\pm 10\%$

6. Character Dimensions:

	Numeral printed with comma		Numeral	(c) Symbol
	(a) Total	(b) Numeral		
Width (W)	1.8mm(0.0709") max.	1.5mm(0.0394") max.	1.4mm(0.0512") max.	1.7mm(0.0591") max.
Height (H)	2.9mm(0.1142") max.	2.45mm(0.0866") max.	2.4mm(0.0866") max.	2.2mm(0.0866") max.

Note: Numerals should be italic when printed with comma in one column.



7. Motor:

(a) Speed

It takes 25 ± 2 msec for one rotation at 15V DC and $+25^{\circ}C$ ($+77^{\circ}F$) when no load is applied to the motor. This time period becomes 25 ± 2.5 msec when the supplied voltage changes from 13V to 17V, the temperature is $0^{\circ}C$ ($+32^{\circ}F$) to $50^{\circ}C$ ($+122^{\circ}F$) and maximum printing load is applied to the motor.

(b) Supplied Power

Voltage : $15 \pm 2V$ DC $+25^{\circ}C$ ($+77^{\circ}F$)

Current : 160 (*200) mA max. (mean current) when the printer is in non-printing condition.

490 (*550) mA max. (mean current)
1.7 A approx. (peak current) } when the printer operates at maximum printing load.

2.1 A approx. (peak current) on starting rotation.

(c) Power Source

Voltage : $15 \pm 2V$ DC

Impedance : 0.5Ω max. (Recommendable)

8. Trigger Magnets for Printing:

(a) Voltage : $15 \pm 2V$ DC

(b) Ohmic resistance: $100 \pm 10\Omega$ $+25^\circ C$ ($+77^\circ F$)

(c) Pulse width : $TP_n \sim TL_n$ (Typ. 16.7 msec)

Scanning time: 6.2 msec max. (Minimum time of $TL_{n-1} \sim TP_n$)

See Fig. I-2, Table I-1

(d) Spark killer : Diode is attached to each magnet

9. Trigger Magnet for Paper & Ribbon Feeding:

(a) Voltage : $15 \pm 2V$ DC

(b) Ohmic resistance: $50 \pm 5\Omega$ $+25^\circ C$ ($+77^\circ F$)

(c) Feeding time : 75 msec max. (Minimum 75 msec is required for feeding.)

Pulse width : 25 msec ($TL_{n-1} \sim TL_n$)

See Fig. II-11

(d) Spark killer : Diode is attached to magnet.

Note: Put 50 msec after feeding pulse, never supply continuous energizing to the plunger.

10. Trigger Magnet for Changing Color to Red:

(a) Voltage : $15 \pm 2V$ DC

(b) Ohmic resistance: $50 \pm 5\Omega$ $+25^\circ C$ ($+77^\circ F$)

(c) Time for changing color to red: 50 msec max. (Minimum 50 msec is required for changing color.)

Pulse width: 25 msec ($TL_{n-1} \sim TL_n$)

See Fig. II-11

(d) Spark killer : Diode is attached to magnet.

Note: Correlation of pulse between paper & ribbon feeding plunger and color changing plunger is illustrated on Fig. II-11.

11. Position Detectors: Magnetic head

Detecting heads T and R pick up timing signals TP and TL corresponding to 13 printing positions and reset signal R at each turn of the print drum.

(a) Timing signals TP & TL

Ohmic resistance of detecting head T: $130 \pm 26\Omega$ $+25^\circ C$ ($+77^\circ F$)

Coefficient of self-inductance: 42 ± 8.4 m henry

Open-circuit voltage: 0.4V min. $+25^\circ C$ ($+77^\circ F$)

S. N. ratio : 20 db min.

Pulse width : 0.2 to 0.4 msec

(See Fig. I-1)

Phase angle of TP : $-303^{\circ} \pm 20^{\circ}$

(See Figs. II-5 & I-2)

Phase angle of TL : $-63^{\circ} \pm 15^{\circ}$

(See Figs. II-5 & I-2)

(b) Reset signal R

Ohmic resistance of detecting head R: $3.4 \pm 0.68 \text{ K}\Omega$ $+25^{\circ}\text{C}$ ($+77^{\circ}\text{F}$)

Coefficient of self-inductance : 2.9 ± 0.58 henry

Parallel capacitor : $0.68^{+0.272}_{-0.136} \mu\text{F}$

Parallel capacitor is attached to detecting head R to make wave form of Reset pulse smooth. (See Fig. I-1)

Open-circuit voltage : 0.4V min.

S. N. ratio : 15 db min.

Wave form of Reset pulse

Reset pulse includes more than 0.4V level of TL and not overlaps above 0.1V level of TP.

Phase angle of R

The angular set point of reset signal R coincides with timing signal TL₁₂.

(See Figs. II-5 & I-2)

Note: The starting point 0° implies the point where the pawl of the ratchet shaft contacts the trigger lever as shown in Fig. I-2.

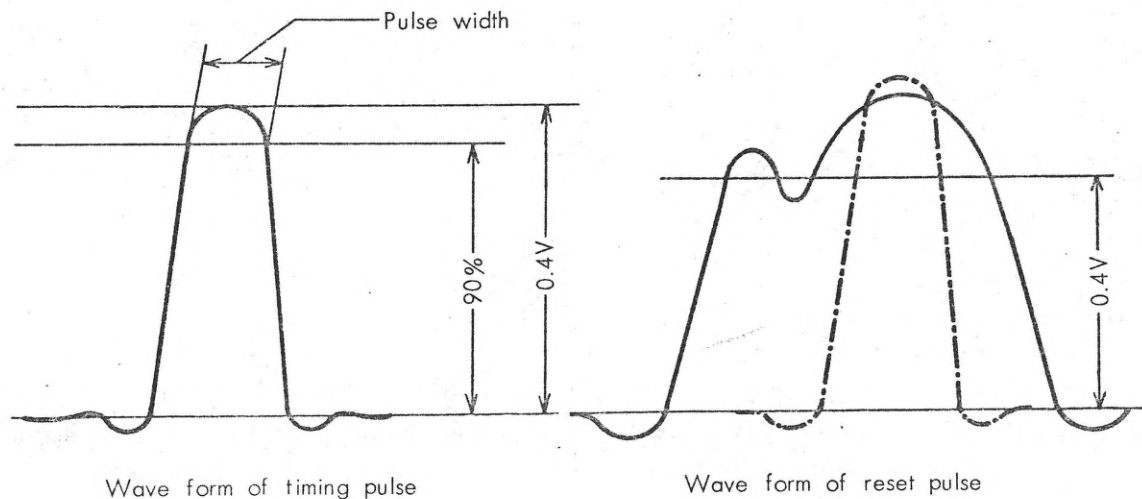


Fig. I-1 DEFINITION OF VOLTAGE AND PULSE WIDTH

12. Insulation resistance between terminal of connectors and frame of printer:

100M Ω min. at 500V DC

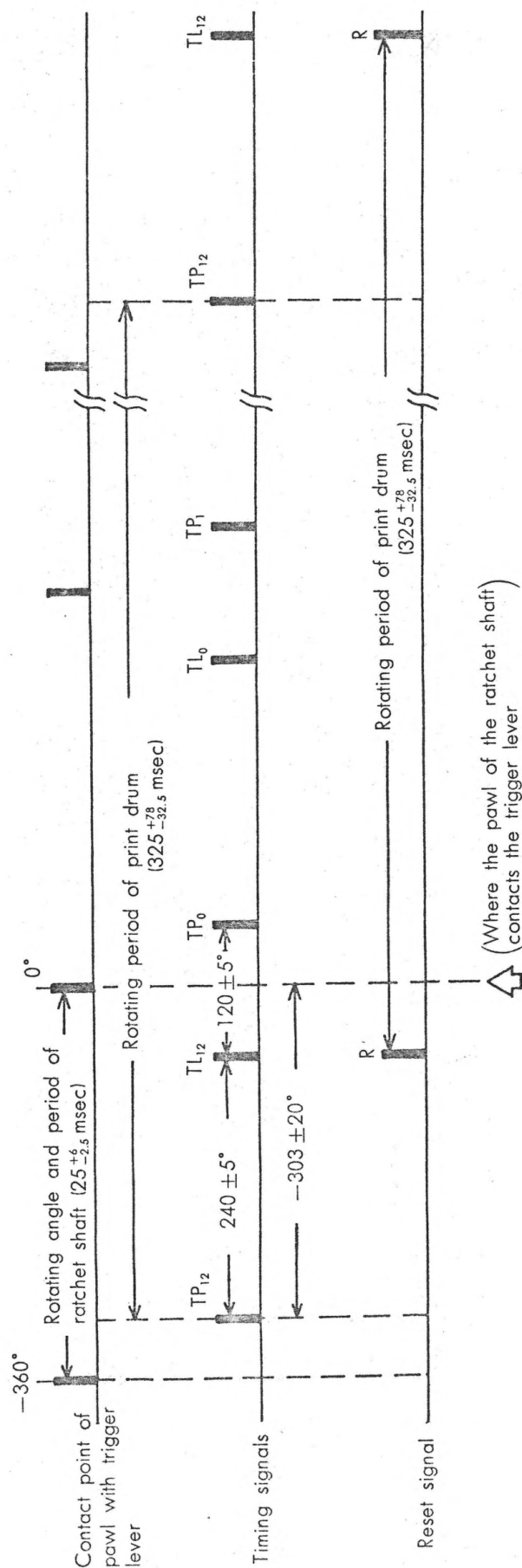
13. Ribbon:

(a) Color : Black and red

(b) Dimensions : Width 13mm (0.5")

Length 6000mm (250")

- (c) Ribbon material recommended: Nylon or vinylon fiber (#40)
 - (d) Ribbon spools : Dia. 35mm (General use type)
(See Fig. I-4)
 - (e) The consistency of inked ribbon: Medium
- 14. Input & Output Pins:**
- (a) Connector : 225J-21821-18811 (115) DDK (Contacts are placed in inch pitch.)
 - (b) Length of Lead wires : 200mm (7.9")
 - (c) Array of Pins : See Fig. I-3
- 15. Paper:**
- (a) Kind : Ordinary paper
(Pressure sensitive paper is available.)
 - (b) Width $\times$ Dia. : 58 ± 1 mm ($2\frac{1}{4}$ " $\times$ 70 mm ($2\frac{3}{4}$ " max.
 - (c) Paper recommended : Approx. 40 kg (1000sht/1030 $\times$ 1450 mm)
- 16. Dimensions:** 146mm width $\times$ 123mm length $\times$ 84.5mm height
(5.748" width $\times$ 4.842" length $\times$ 3.326" height)
(See Fig. I-5)
- 17. Weight:** 1.5kg (3.3lb)
- 18. Noise:** 55 phon (55db) max. in stand-by
(According to JIS Z 8731-1966)
- 19. Operating Temperature Guaranteed:**
0°C (+32°F) to +50°C (+122°F)
- 20. Reliability:**
- MTBF : 3 million lines
(continuous printing)
- 21. Attached drawing:**
- Overall Dimensions : See Fig. I-5



Note: Triggering signal having a pulse width over 14.7 msec must rise on timing signal TP_n and fall down just exactly on timing signal TL_n .
 The scanning time necessary for comparing one character on the print drum with the DATA of the whole columns is set between TL_{n-1} and TP_n .
 Memorize the printing data, and then drive the trigger magnet exactly coinciding with timing signals TP_n and TL_n . In this case, the maximum scanning time is 6.2 msec.

Fig. I-2 MECHANICAL TIME CHART A

Period	Min.	Typ.	Max.
TP_n to TL_n	14.7 msec	16.7 msec	21.1 msec
TL_{n-1} to TP_n	6.2	8.3	10.8

Note: Periods TP_n to TL_n and TL_{n-1} to TP_n shown by the angular position in Fig. I-2 have been converted to time periods in Table I-1. The values of Minimum, Typical, and Maximum show time periods according to setting positional error of detecting heads, voltage characteristic, ambient temperature, and printing load.

Table I-1 TIMING SIGNAL PERIOD

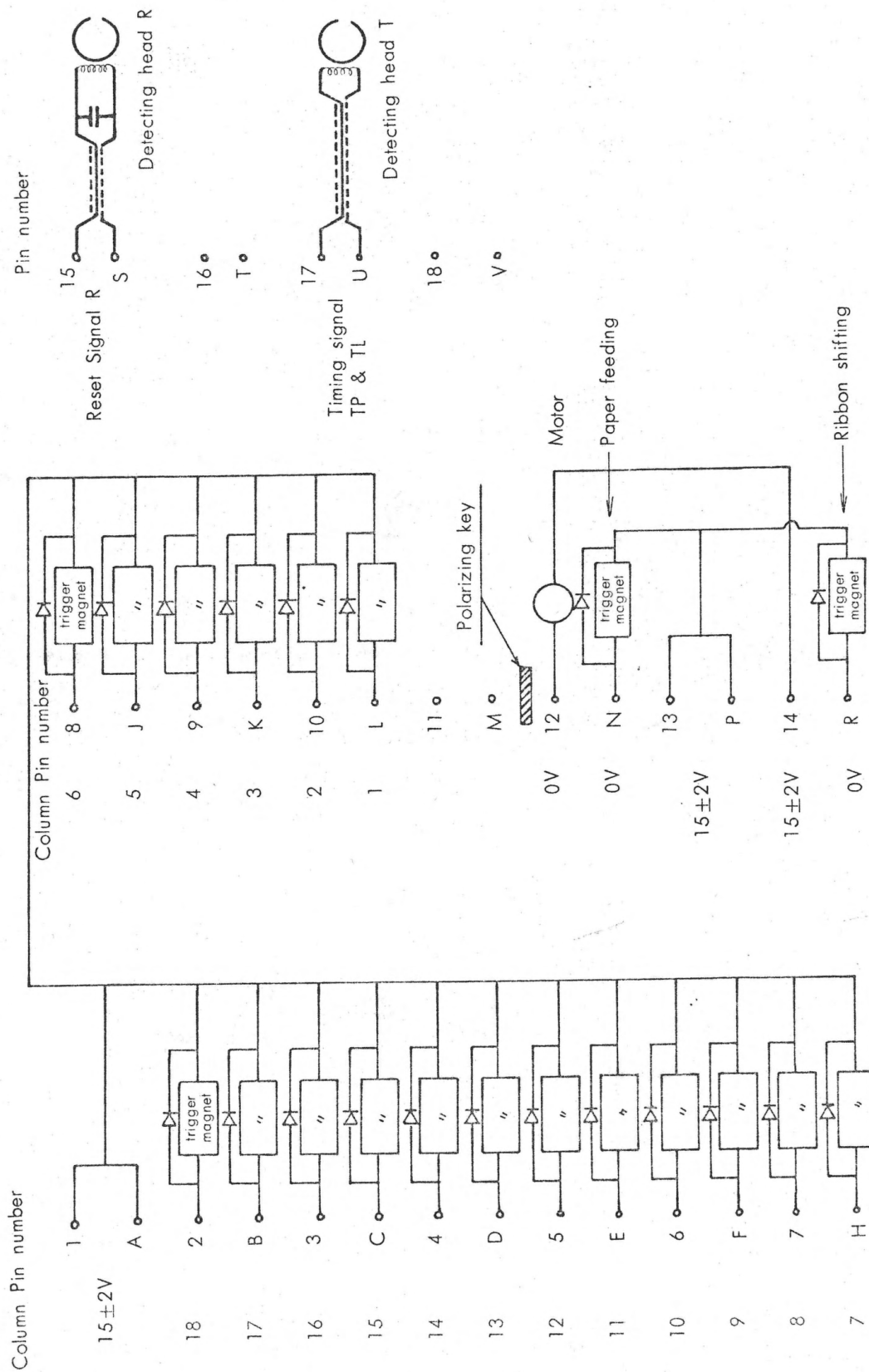


Fig. I-3 ARRAY OF PINS (102)

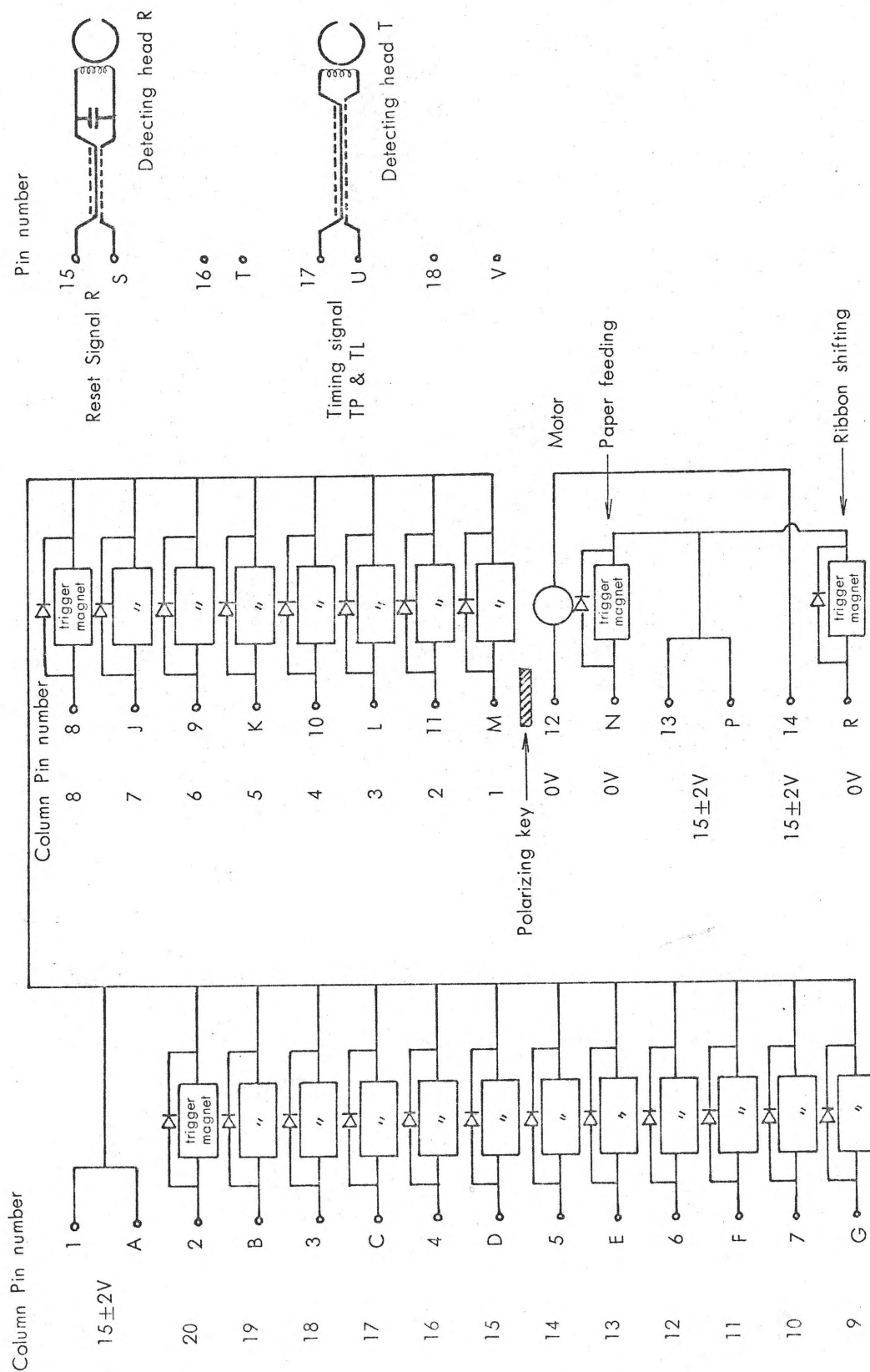
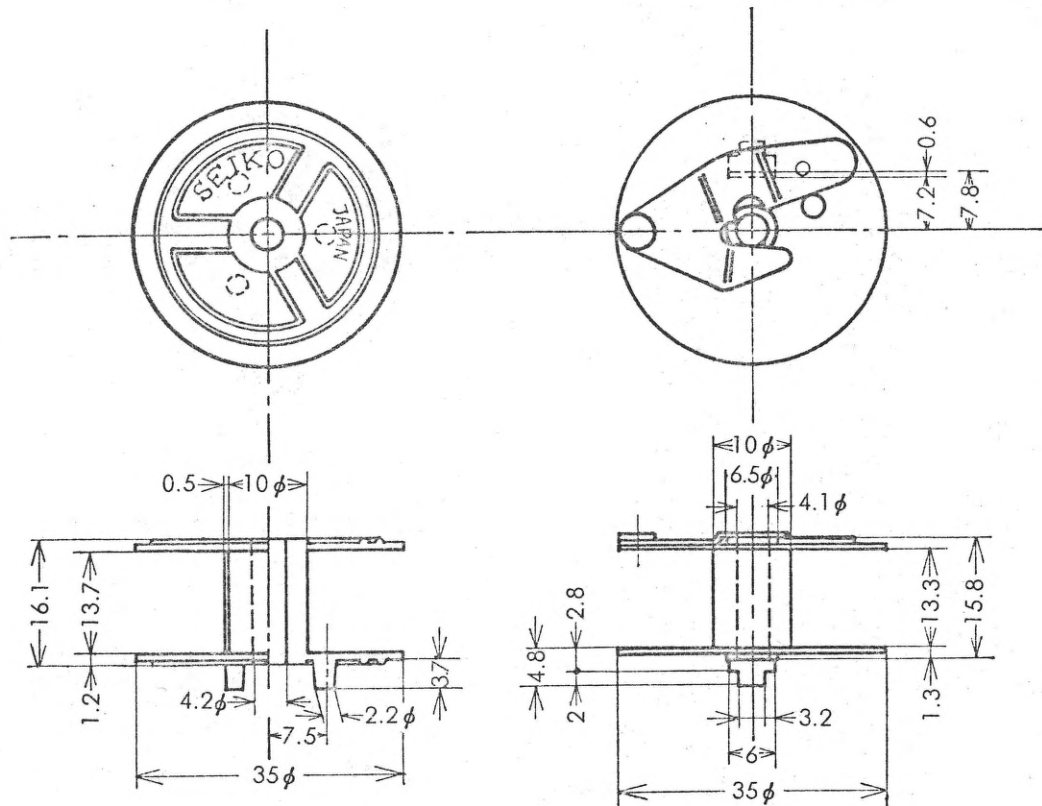


Fig. I-3-1 ARRAY OF PINS (102W)

Type I

Type II



SEIKO Spool for MODEL-102

COPIAN P-305

Addox-x

Odhner

Facit

(For Adding Machine)

Note: Both Type I and Type II are usable.

Fig. I-4 STANDARD OF RIBBON SPOOL

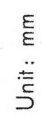


Fig. 1-5 OVERALL DIMENSIONS

II CONSTRUCTION AND OPERATION

Note: *mark shows MODEL-102W

1. Construction

Digital printer MODEL-102 & 102W consists of six mechanisms and frame, that is to say, printing mechanism, paper feeding mechanism, motor, reduction gear train, position detector, ribbon feeding mechanism and frame. All of these mechanisms are driven by a brushless hall motor.

The printer has two frames G and M which are connected in parallel by two supporting bars, an actuating lever guide, a trigger lever guide, and two trigger magnet mounting plate. All the mechanisms are arranged outside or inside of the frames. Moreover, lower parts of the frames G and M are bent to form the mounting foot to the equipment.

Printing mechanism has 18 (*20) columns each consisting of the following main printing components—a trigger magnet, an actuating lever, a trigger lever and a hammer. All the components are arranged in parallel with each columns. Print drum is placed on the front upper part of the frames, supported to frames G and M by two plane bearings and is opposite to the hammer.

Paper feeding mechanism are arranged at the inside upper part of frames G, M and also outside of frame G. In the inside upper part, there are a paper feeding roller and a paper holding roller which presses against paper feeding roller. And these are rotated intermittently by the paper feeding command. That is to say, when a paper feeding rack lever mounted at the outside of frame G engages with a print drum gear intermittently, the paper feeding lever is moved vertically. And this vertical motion drives a paper feeding ratchet shaft co-axial with the paper feeding roller. Then the intermittent rotation is obtained. A paper guide is arranged surrounding the paper feeding roller and the print drum. It guides the paper into the pre-determined positions.

A hall motor which is the main driving power source of the printer is arranged at the outside of the frame M. It consists of two doughnut-shaped ferrite magnet which is co-axial with a rotor shaft and a motor circuit board comprising a driving coil and the motor circuit parts. And it is designed to rotate at uniform velocity both at loaded and unloaded condition.

Reduction gear train serves for rotating a print drum simultaneously with a ratchet shaft (which is co-axial with a rotor of the motor and has a ratchet for giving printing energy to a hammer.) A reduction ratio of 1/13 is set between the print drum and the ratchet shaft. This reduction gear train is mounted at the outside of the frame G together with the paper feeding components.

At the lower part of the print drum gear on the frame G side, two detecting heads are arranged in a body. And they detect the rotation of the ratchet shaft and the print drum, and transmit the print timing to the control circuit.

A power transmitting device which operates the ribbon feeding component and two trigger magnets which converts the electric signals such as paper feeding command or red

print command, into mechanical movement are arranged on the frame G.

Ribbon feeding mechanism is arranged on the back upper part of the printer. It moves an inked ribbon gradually whenever each printing is over. And when the inked ribbon was wound up on a spool it reverses the feeding automatically.

A gear cover is fitted on the frame G and a motor cover on the frame M. These covers protect all the components.

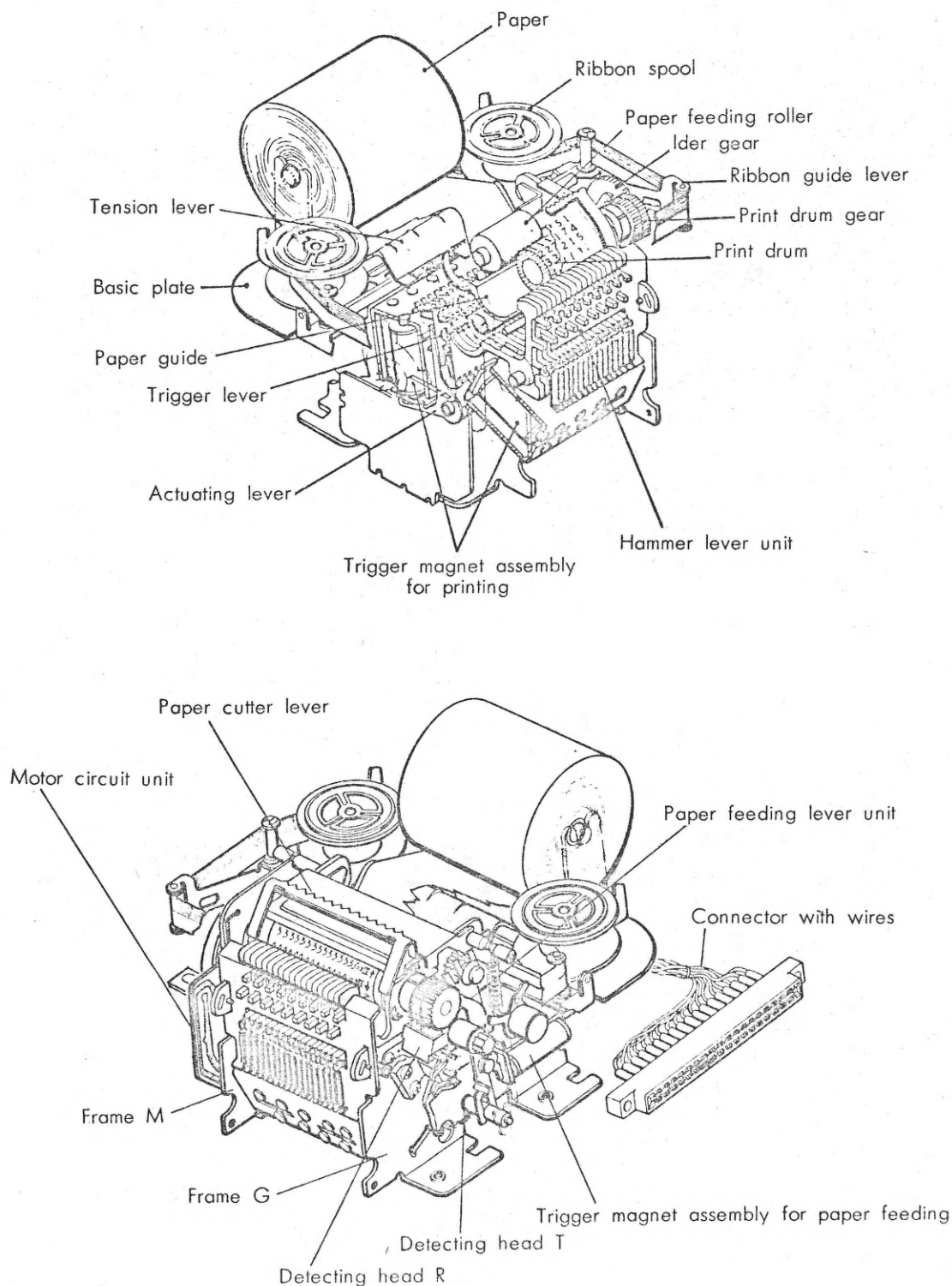


Fig. II-1 PRINTER CONSTRUCTION

2. Operation

2-1 Printing

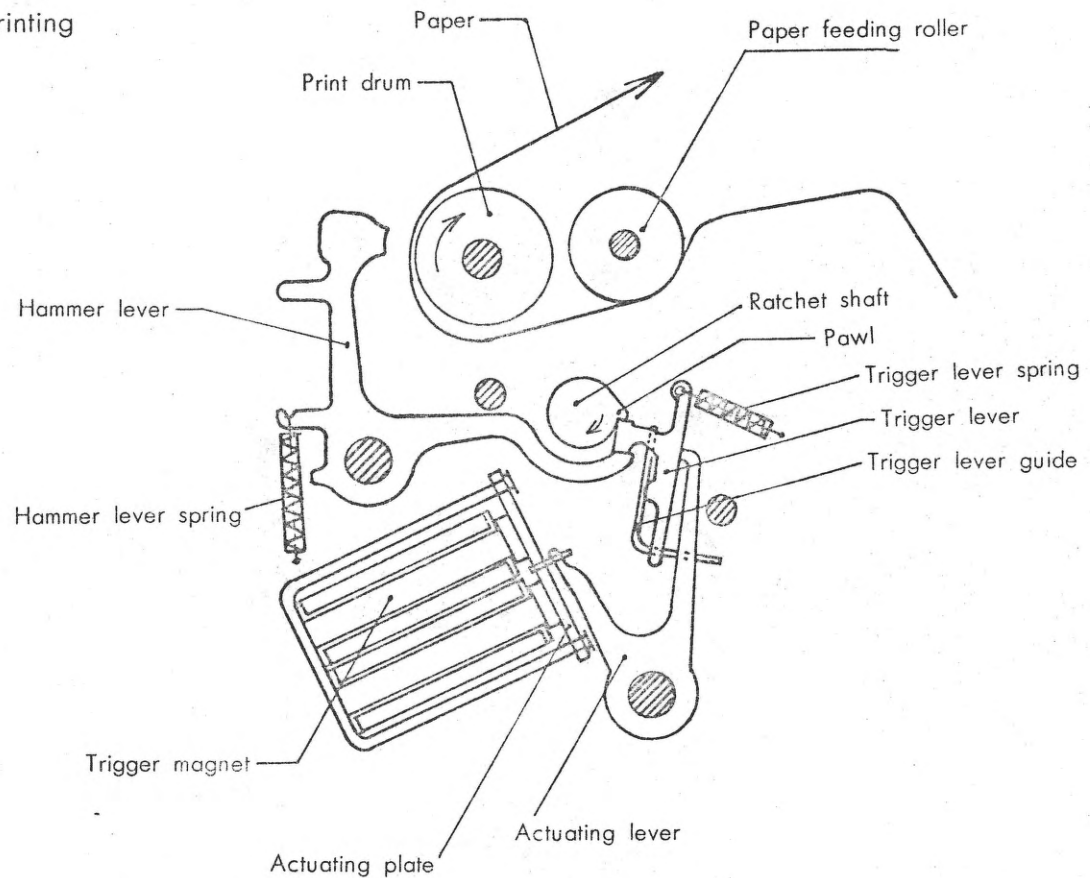


Fig. II-2 PRINTING MECHANISM

This printer is a type referred to as FLYING PRINTERS, its print drum rotating continuously. Printing is carried out by selecting a print hammer corresponding to character disposed on the surface of the drum.

In conventional large-capacity Flying Printers used in computers, the print hammers are generally electrically driven directly; whereas in this printer, they are driven by motor rotational energy which consumes a very small amount of power resulting in low electric consumption. The printing principle of this printer is illustrated as follows.

Refer to Fig. II-2 showing a schematic view of the printing portion of the printer. The print drum and the ratchet shaft connected by gears, rotate continuously in the direction of the arrow and the extreme points of the trigger levers are disengaged from the pawl locus during a nonprinting condition controlled by springs which pull the trigger levers downwards. In a nonprinting condition, the trigger magnets are not actuated electrically, and the hammers are lifted upward in a neutral position by the hammer lever springs.

The ratchet shaft, connected directly to the motor shaft rotates at 2400rpm, a ratio 13:1 used between the ratchet shaft and the print drum. Thirteen characters are placed at equal pitches around the print drum; therefore, one rotation of the ratchet shaft causes a $1/13$ th rotation of the print drum (i.e. it advances one character). It takes 25 msec ($60/2400$ sec) for one rotation of the ratchet shaft, consequently every 25 msec, a character passes under the

hammer, and every 325 (25×13) msec the drum completes one rotation.

When a certain character (for example 5) is to be printed, a trigger magnet must be actuated just after the preceding character (for example 4) passes under the print hammer. The actuating lever, pulled by the trigger magnet, rotates counterclockwise, the upper end of the trigger lever supported by the trigger lever guide is pressed to the left rotating counterclockwise, and the left end of the trigger lever enters in the locus, it is struck and caused to leap by the pawl of the ratchet shaft towards a hammer lever. The hammer lever strikes a character through the inked ribbon and paper, and thus printing is effected.

It takes about 2.5msec for the hammer to strike a character after the trigger lever is struck by the pawl. The angular position of characters on the print drum should be shifted by $25/325 \times 2\pi$ which is adjusted by gears between the ratchet shaft and the print drum, in order that the character is right in the center of the hammer when the hammer strikes the character.

By turning off the trigger magnet just before printing is finished, all the parts are restored through spring force of the hammer lever and the trigger lever, after printing is finished.

A motor is not independent from the printer, in other words, the ratchet shaft, not only gears into the print drum through the reduction gear trains, but it also strikes the trigger lever connected to the print hammer. Thus, all power of the printer is supplied with the rotational energy from a brushless hall motor.

2-2 Paper Feeding

Paper feeding is effected by means of transmitting the rotary motion of the print drum into reciprocation of the paper feeding lever, and then transmitting this reciprocation into the

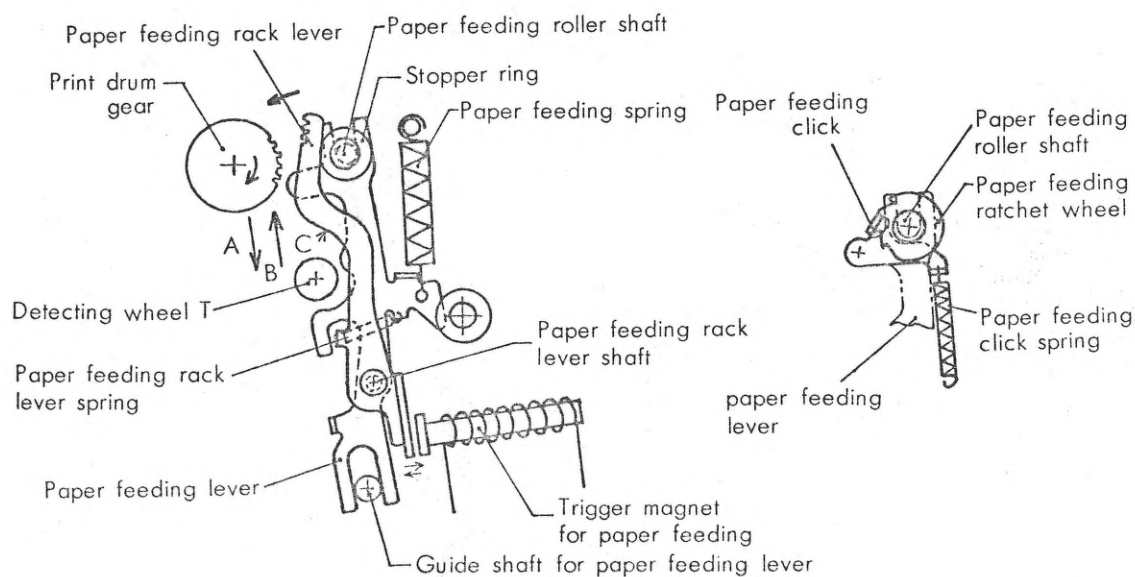


Fig. II-3 PAPER FEEDING MECHANISM

intermittent rotation. Fig. II-3 shows the paper feeding mechanism.

With the paper feeding command, the trigger magnet assembly for paper feeding is magnetized, and then the lower portion of paper feeding rack lever is attracted and is rotated counterclockwise on the paper feeding rack lever shaft, expanding the paper feeding rack lever spring. Then the upper portion of paper feeding rack lever engages with the print drum gear. According to the rotation of the print drum gear, the paper feeding lever which is in a body with the rack lever, moves in the direction of arrow A, expanding the paper feeding spring. When the rack lever moves to the predetermined point, the C part of the rack lever touches the detecting wheel T, and the rack lever disengages from the print drum gear. Then the paper feeding lever returns in the direction of arrow B due to the contraction of the paper feeding spring.

At this time, the paper feeding trigger magnet has no electricity already, so the paper feeding rack lever is returned to ordinary position by the paper feeding rack lever spring.

As the paper feeding lever moves up-and-down in the directions of the arrows A and B, the paper feeding ratchet wheel is sent one by one when the paper feeding lever moves in the B direction due to the function of the paper feeding click supported by the paper feeding lever and the paper feeding ratchet wheel co-axial with the paper feeding roller. Thus, the paper feeding roller is rotated intermittently. Paper feeding speed is 4.24 mm (1/6") per one pitch.

Fig. II-4 shows a cross sectional view of the paper feeding process. The rolled paper is guided in the following order; a tension lever→a paper feeding roller→a paper guide (Inside & Outside)→a print drum→a paper cutter lever. Paper feeding energy is supplied frictional force produced by the intermittent rotation of the paper feeding roller. By the rotation of the paper feeding roller, the paper holding roller rotates and serves to fix the rolled paper. If the rolled paper is under the influence of sudden tension, at rotating time of the paper feeding

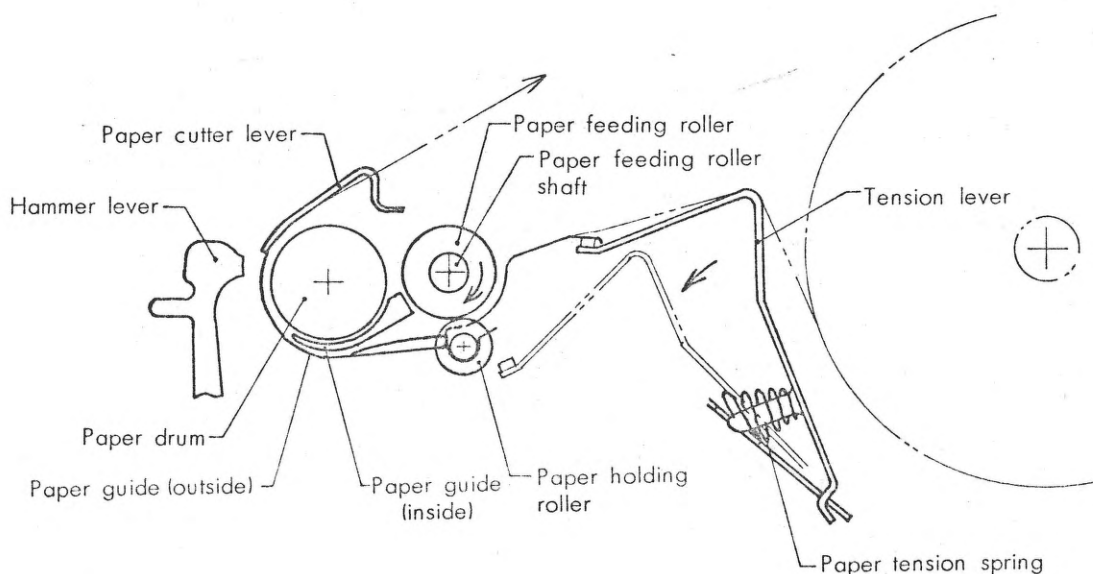


Fig. II-4 PAPER FEEDING PROCESS

roller, the tension lever rotates to the dotted line position and at waiting time, it returns to the initial position by the function of the paper tension spring. In other words, the tension lever serves to produce the paper loosening and at paper feeding time, it works to protect the paper feeding roller from the rolling paper inertia.

The time required of each operation in the paper feeding mechanism is as follows.

From energizing the paper feeding trigger magnet to engagement of the rack with the print drum	approx. 18msec
--	----------------

From engagement of the rack to disengagement	approx. 35msec
--	----------------

From disengagement of the rack to paper feed end	approx. 10msec
--	----------------

The above required times are mean values. The total time (from energizing to paper feed end) is 63 msec, and the maximum is 70 msec.

2-3 Position Detector

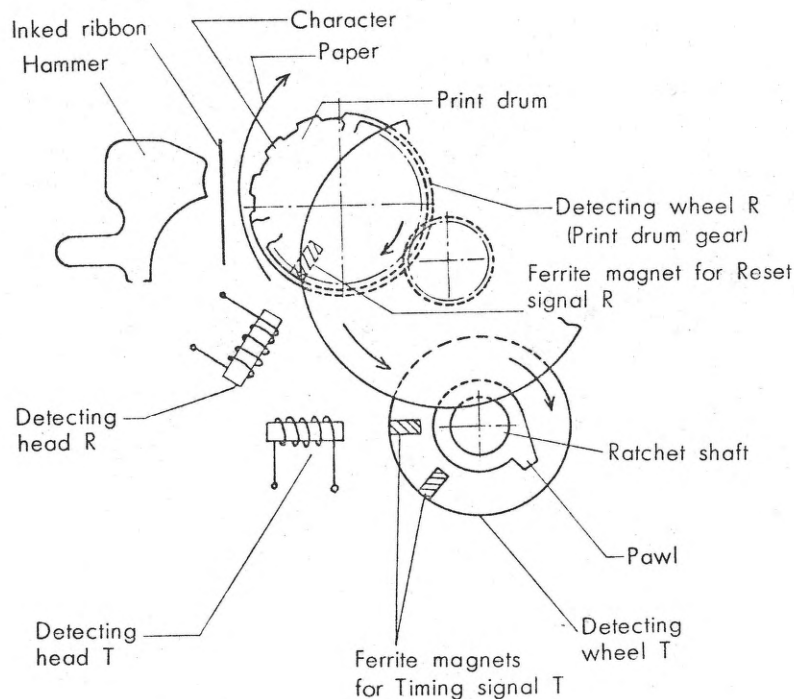


Fig. II-5 POSITION DETECTING MECHANISM

The detecting heads shown in Fig. II-5 generate detecting signals, informing the control circuit of the character positions.

Two signals are necessary for timing operation: one, a pair of timing signals from the detecting head T, corresponding to one rotation of the ratchet shaft (i.e. one character passing under the hammer); the other, reset signal from the detecting head R corresponding to one rotation of the print drum. These signals are generated electromagnetically by magnetic flux from ferrite chips buried in the detecting wheels T and R.

Through two ferrite magnets buried in the detecting wheel T, detecting head T picks up the timing signals TP and TL corresponding to 13 character positions on the print drum. Signal TP is timing for energizing the trigger magnets, and signal TL is for deenergizing the

trigger magnets. Reset signal R from the detecting head R coincides with the timing signal TL₁₂ as shown in Fig. I-3.

2-4 Motor

A self-starting and brushless hall motor which always rotates in the predetermined direction is installed. This motor consists of the rotor (two permanent magnets having six pairs of magnetic poles are opposed at stated interval) and the stator (the circuit board comprising a hall element, two channel amplifier, driving coils, a control circuit, and terminal).

As shown in Fig. II-6, the driving coil and the hall element of the stator are placed between the rotors, that is in the magnetic field of the rotors, and are designed to act electromagnetically with the permanent magnets.

Self-starting of the motor is effected as follows:

The hall element is always supplied with the magnetic flux even when the motor is stopped. When the hall element is energized, the hall voltage (output) is generated to one of two output terminals according to the direction of the magnetic flux. This voltage is amplified in the motor circuit board to activate one driving coil. This driving current and the permanent magnets interact on each other, then the rotor starts rotating. (Law of electromagnetism)

The rotor has six split magnetic poles, so the direction of the magnetic flux (N and S) changes every angle of 60 degrees. When the next magnetic pole comes to the hall element by the rotation of the rotor, the magnetic flux supplied to the hall element turns to the opposite direction and the hall voltage is applied to the other output terminal. This hall voltage is also amplified to activate the other driving coil.

In this way, the self-starting of the motor in the predetermined direction and the smooth rotation can be kept by properly arranging the hall element, the driving coil, and N & S pole of the rotor.

The speed control circuit in the motor circuit board determines the number of rotations in load and non-load condition. This circuit converts the induced current generated in the driving coil to speed control signal and by this signal electric current to driving coil is changed to control the motor speed so that energy is not consumed wastefully in a nonprinting condition and sufficient printing energy is supplied automatically.

To improve the voltage characteristics, fluctuation of the input voltage is added to speed control signal. A thermister is used in the speed control circuit to minimize the influence by the ambient temperature.

2-5 Ribbon Mechanism

The ribbon mechanism is powered by reciprocation of the paper feeding lever. Fig. II-7 shows the power transmitting mechanism from the paper feeding lever to the ribbon mechanism. With the reciprocation of the paper feeding lever, the L-shaped part A of the paper feeding lever reciprocates. As A part engages with the B part of the driving lever, the driving lever rotates counterclockwise on the driving lever shaft. At this time the driving lever rotates extending the driving lever spring, so then with the movement of the paper feeding lever in the

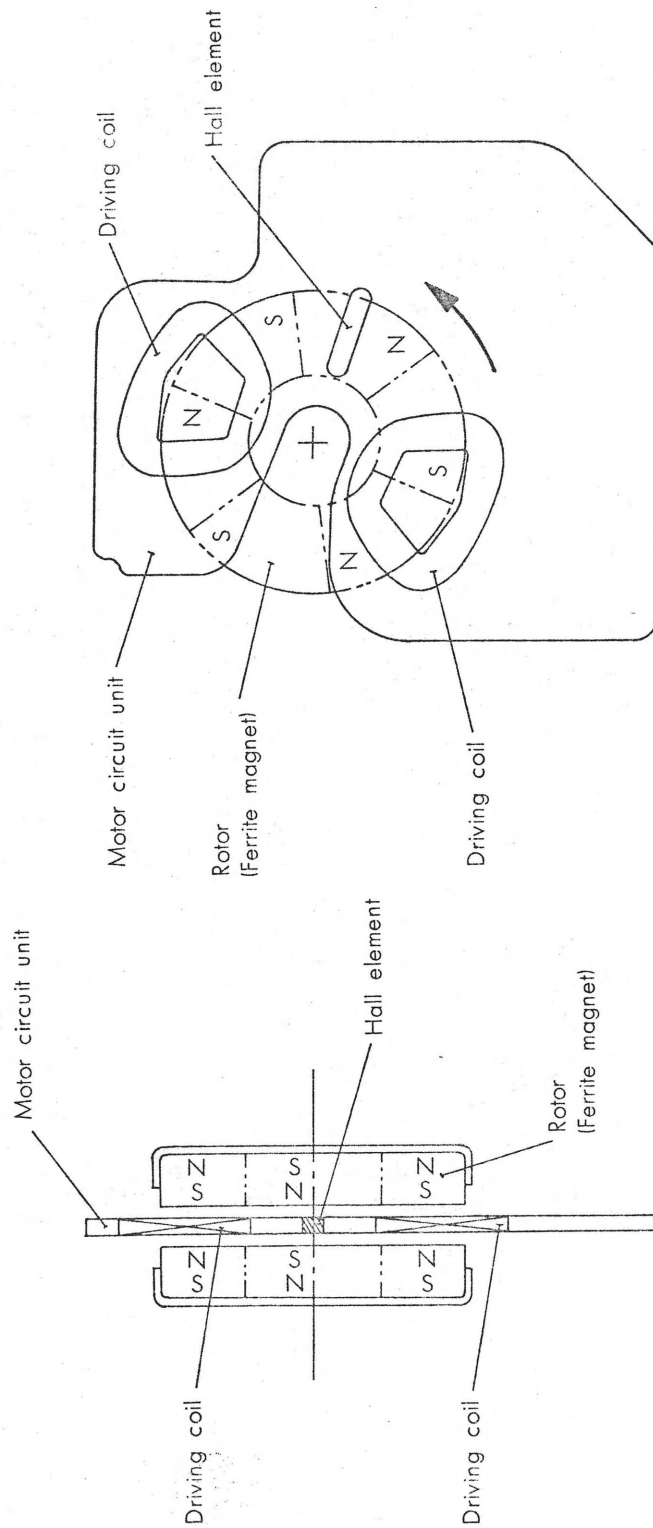


Fig. II-6 MOVEMENT OF MOTOR MECHANISM

upper direction, the driving lever rotates clockwise by the contraction of the driving lever spring. Consequently with the up-and-down motion of the paper feeding lever, the C part of the driving lever moves right and left. The right and left motion of the C part is transmitted to a transmitting lever and the automatic reverse of the ribbon feeding or the ribbon feeding are effected. Further detail explanation is as follows.

Figs. II-8 and II-9 shows a plane view of the ribbon mechanism.

The right and left motion of the C part of the driving lever in Fig. II-7 is transformed into the reciprocation in the directions of the arrows D and E of the transmitting lever on the transmitting lever shaft in Fig. II-8. Ribbon feeding pawls G and M are supported on the

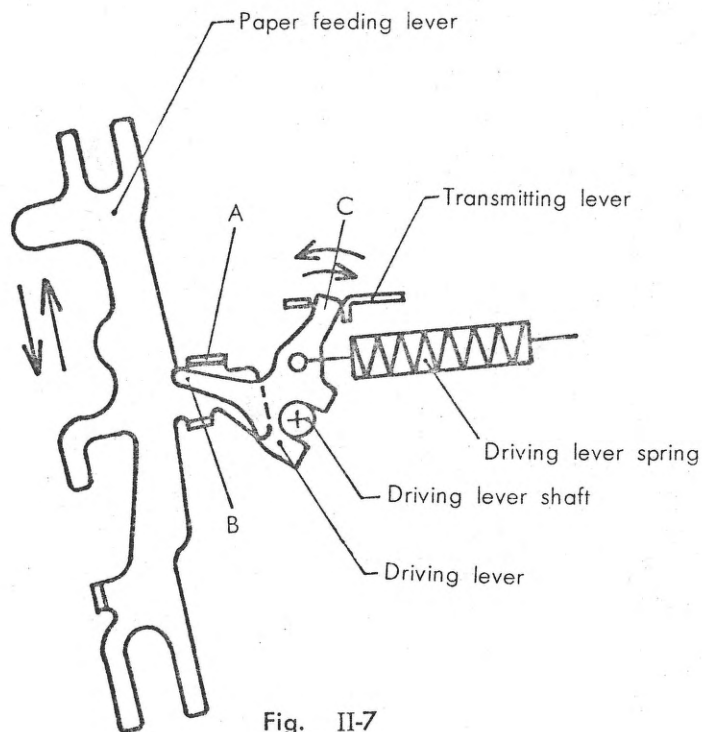


Fig. II-7

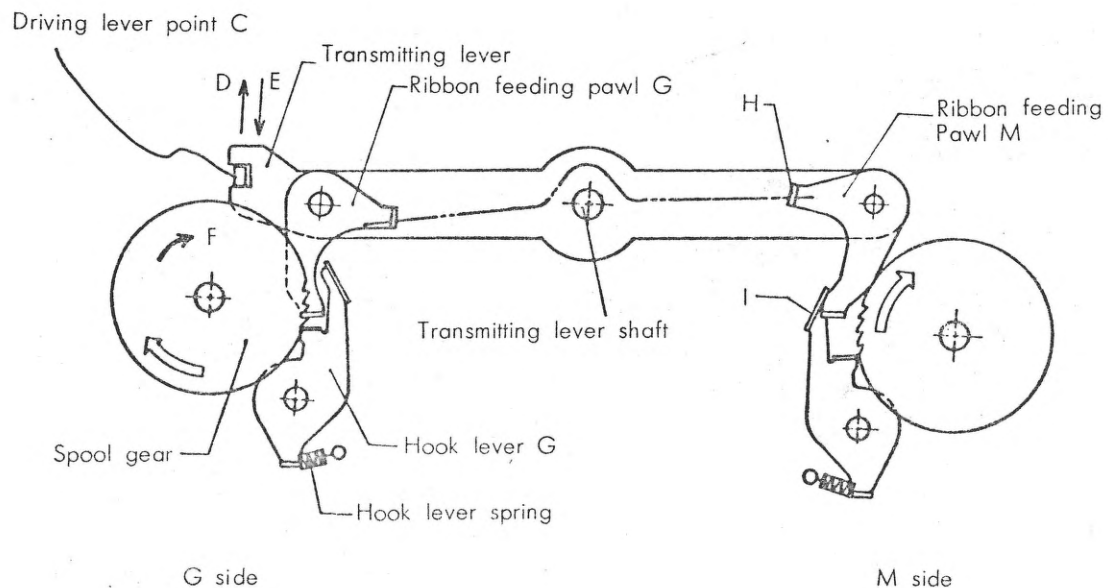


Fig. II-8

both ends of the transmitting lever. Fig. II-8 shows the ribbon feeding pawl G engaging with the spool gear and the pawl M disengaging with it.

As the ribbon feeding pawl G is always pressed against the spool gear by the ribbon feeding pawl spring, it rotates the spool gear in the direction of the arrow F with the movement of the transmitting lever in a E direction. Then with the motion of the transmitting lever in the D direction, the ribbon feeding pawl G returns to the original position without reversing the spool gear due to the function of the hook lever.

And the H part of the ribbon feeding pawl M is pushed up by the function of the exchanging direction spring, so the ribbon feeding pawl M disengages with the spool gear. At this time the ribbon feeding pawl M pushes up the I part of the hook lever and the hook lever disengages with the spool gear. Then the spool gear on the M side becomes free. Thus, the ribbon feeding is effected.

The following is the explanation of exchanging the ribbon feeding direction.

Fig. II-9 shows that the ribbon is wound on a spool of G side, and then it is wound up on a M side spool.

The J part of the detecting lever is always pressed against the ribbon by the detecting lever spring, so as the M side ribbon decreases, the end K of the detecting lever rotates gradually in the direction of the arrow L. And at last it contacts with end of the M side of the exchanging direction lever just before the M side ribbon is over. Then the exchanging direction lever, which reciprocates in the directions of the arrows D and E together with the transmitting lever, is controlled to rotate in the E direction. So only the transmitting lever rotates in the E direction and the positions of the transmitting lever and the exchanging direction lever is reversed by the exchanging direction spring. As a result, the ribbon feeding pawl M engages with the spool gear and the pawl G disengages from it. Thus the ribbon winding direction is reversed. This action is repeated alternately on M side or on G side.

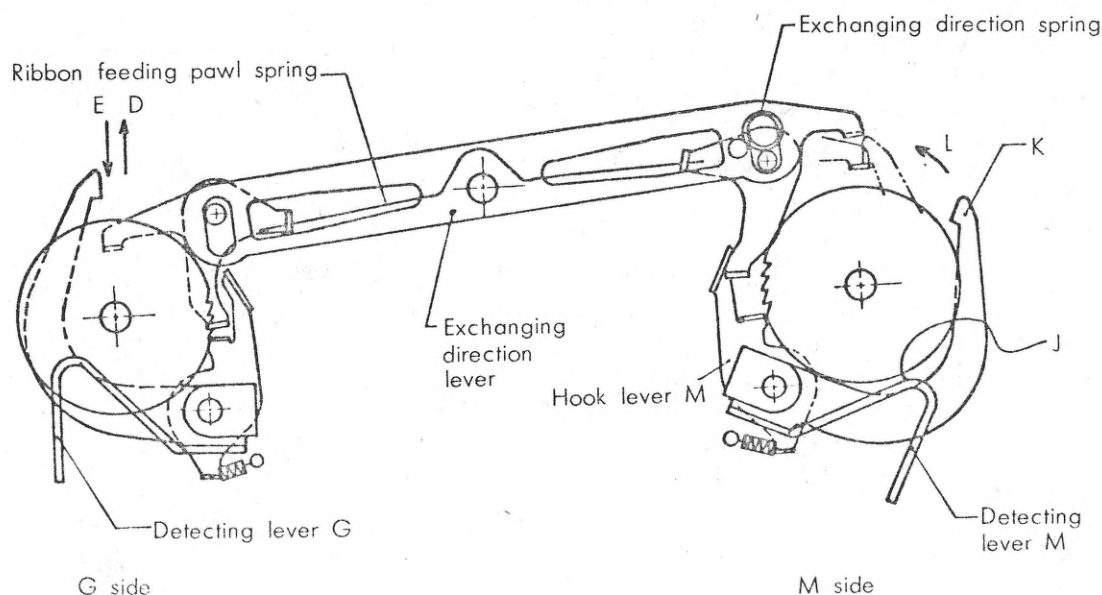


Fig. II-9

Exchanging from black print to red print is accomplished as follows: Ribbon (black-and-red) is guided over the printer by ribbon guide rollers. Fig. II-10 shows the color exchanging mechanism mounted on the frame G side. In nonprinting, black inked part of the ribbon is between the hammer and the paper, and printing is performed in black. To print in red, a trigger magnet for changing color to red is energized by red print command, and a ribbon clutch lever is attracted. Therefore the pawl part of the ribbon clutch lever is disengaged from the L-shaped part of a ribbon shift lever. Then the ribbon shift lever is raised by stroke S due to the ribbon shift lever spring. The ribbon guide lever connected to the shift lever is rotated in the direction of the arrow N around the ribbon guide lever shaft on the right side. The red inked part moves between the hammer and the paper and printing is performed in red.

Exchanging from red print to black print is accomplished at the same time with paper feeding. With the downward movement of the paper feeding lever, the P part of the paper feeding lever presses down the ribbon shift lever. And when the ribbon shift lever is pressed down to the predetermined position, the ribbon clutch lever engages with the ribbon shift lever due to the ribbon clutch lever spring. Then printing is returned to black.

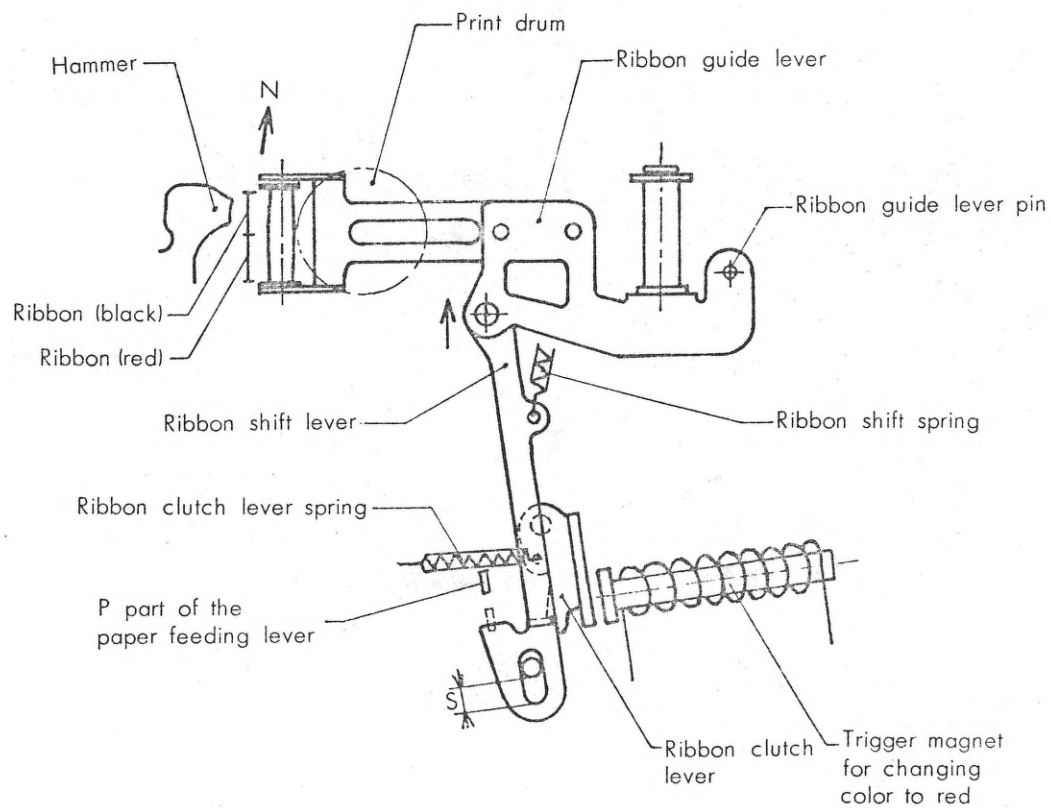


Fig. II-10

3. Timing for Printing

3-1 Mechanical Timing

Fig. II-11 shows the mechanical timing for printing. Two signals (a pair of timing signals and a reset signal) are generated from the printer. The pair of timing signals is generated corresponding to 13 printing positions; i. e. at every $1/13$ rotation of the print drum. The reset signal is generated corresponding to the starting position; i. e. at each turn of the print drum. Each character has two timing signals TP and TL. Timing signal TP is timing for energizing the trigger magnets, and timing signal TL being generated 14.7 msec min. after timing signal TP, is timing for cutting the current of the trigger magnets.

The operation of printing the eleventh character from the starting position is as follows. (In this example ".") When the tenth timing signal TL₉ is generated from the printed data scanning is over within 6.2 msec, and after memorizing the printing data, at the same time when TP₁₀ is generated, the print trigger magnet is energized. This timing is shown by A in Fig. II-11. Within 14.7 msec after the trigger magnet is energized, the end of the trigger lever enters the locus of the pawl of the ratchet shaft. 21 msec after the timing signal TP₁₀ is generated, the end of the trigger lever is struck by the pawl of the ratchet shaft. This striking force drives the hammer lever through the trigger lever, and 2.5 msec after the trigger lever is struck, the hammer strikes the character on the print drum, and printing one character is completed. To print in red, it is necessary to energize the trigger magnet for changing color to red for 25 msec minimum before starting to print. In both red and black printing, the trigger magnet for paper & ribbon feeding must be energized for about 25 msec after printing is completed and the paper is fed by one line and at the same time, the ribbon is fed by 1.0~4.0 mm. As a spark killer, the diodes are attached respectively to the trigger magnets for printing, the trigger magnet for paper & ribbon feeding and the trigger magnet for changing color to red.

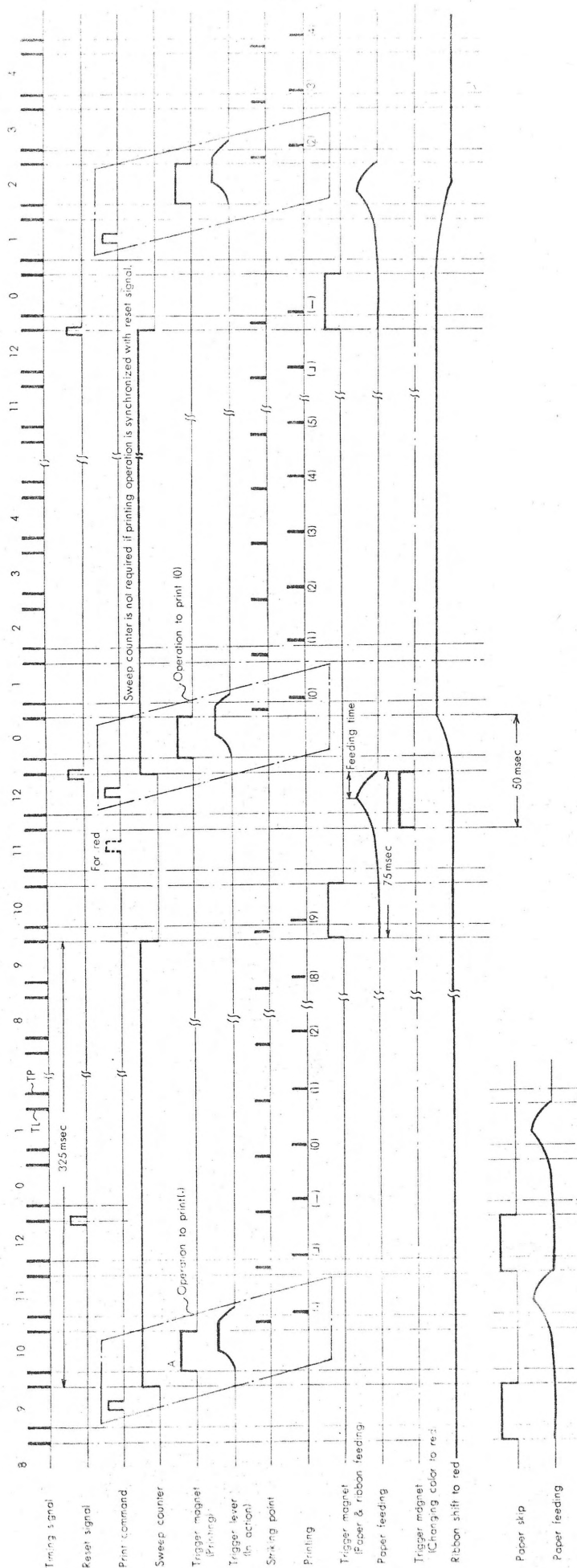


Fig. II-11 MECHANICAL TIME CHART B (Example)

3-2 Electrical Timing

A timing schedule for printing, for example (1975. 10. 12), is as follows:

Any character arrangement is optional, but if the characters on the surface of the print drum are arranged as shown in Fig. II-12, for example, the timing chart for printing (1975. 10. 12) will be as Fig. II-13 illustrates.

Numerals and symbols to be printed are:

Column 13	1
Column 12	9
Column 11	7
Column 10	5
Column 9	.
Column 8	1
Column 7	0
Column 6	.
Column 5	1
Column 4	2

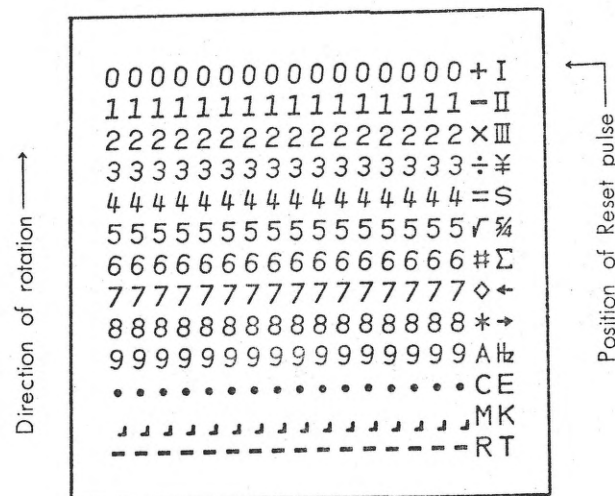


Fig. II-12 EXAMPLE OF CHARACTER PATTERN (102)

If the character corresponding to the first timing signal after print command is the one to be printed in any column, the trigger magnet of that column is switched ON. In the example of Fig. II-13, the first timing signal is "9" and it is to be printed in the 12th columns; thus, the trigger magnets of the 12th columns are switched ON. The character corresponding to the next timing signal is ".", to be printed in the 6th and 9th columns; thus, the trigger magnets of the 6th and 9th columns are switched ON by this next timing signal. By this method, each time timing signal appears, the trigger magnet of the column corresponding to timing signal to be printed is switched ON. When the thirteen timing signals have appeared, the print drum completes one rotation, finishing the printing of one line.

When the thirteenth character is printed, apply current through the paper & ribbon feeding trigger magnets. Now one print cycle time is completed.

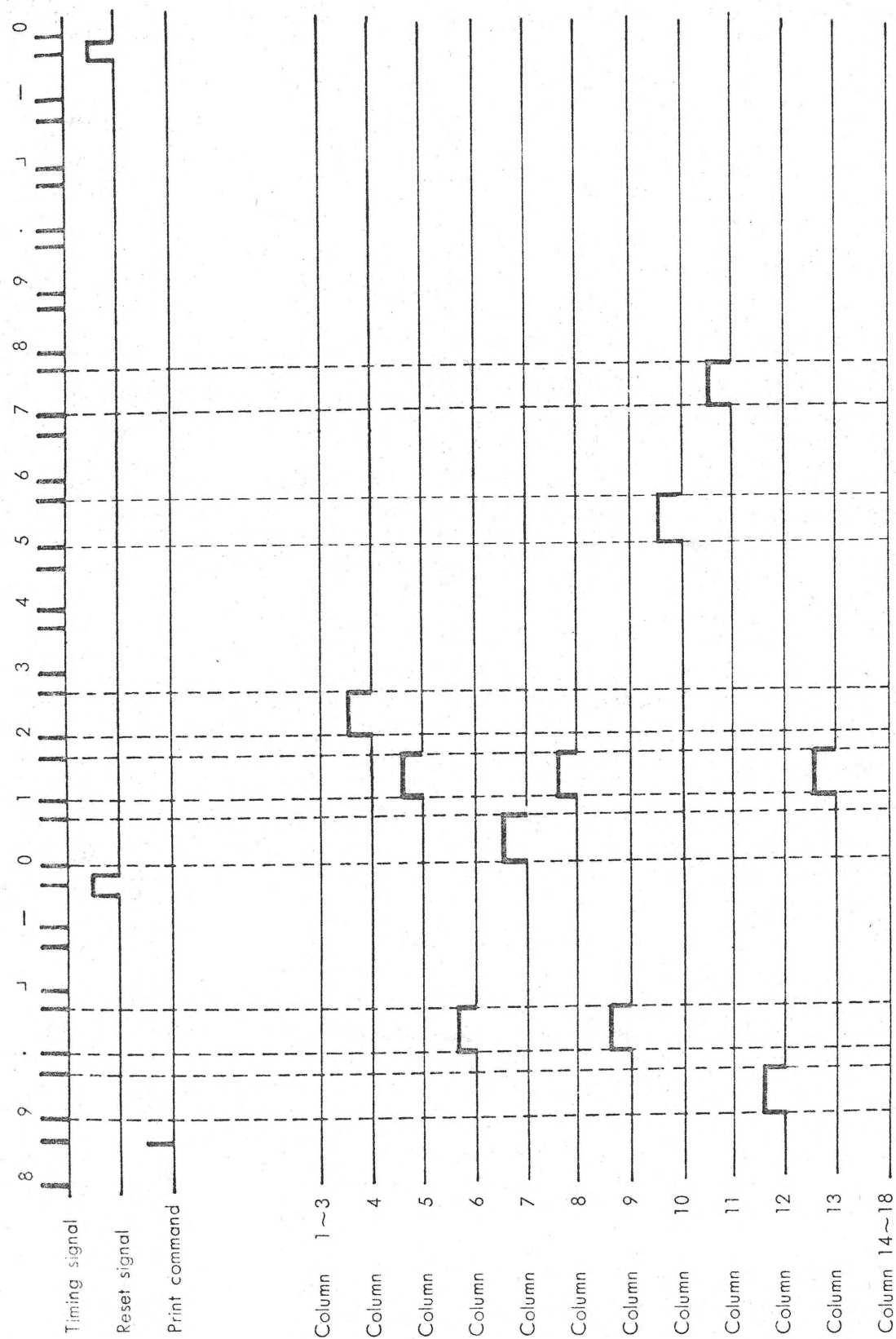


Fig. II-12 EXAMPLE OF TIME CHART (102)

III EXPLODED VIEW

1. Main Printing Components and Ribbon Feeding Components

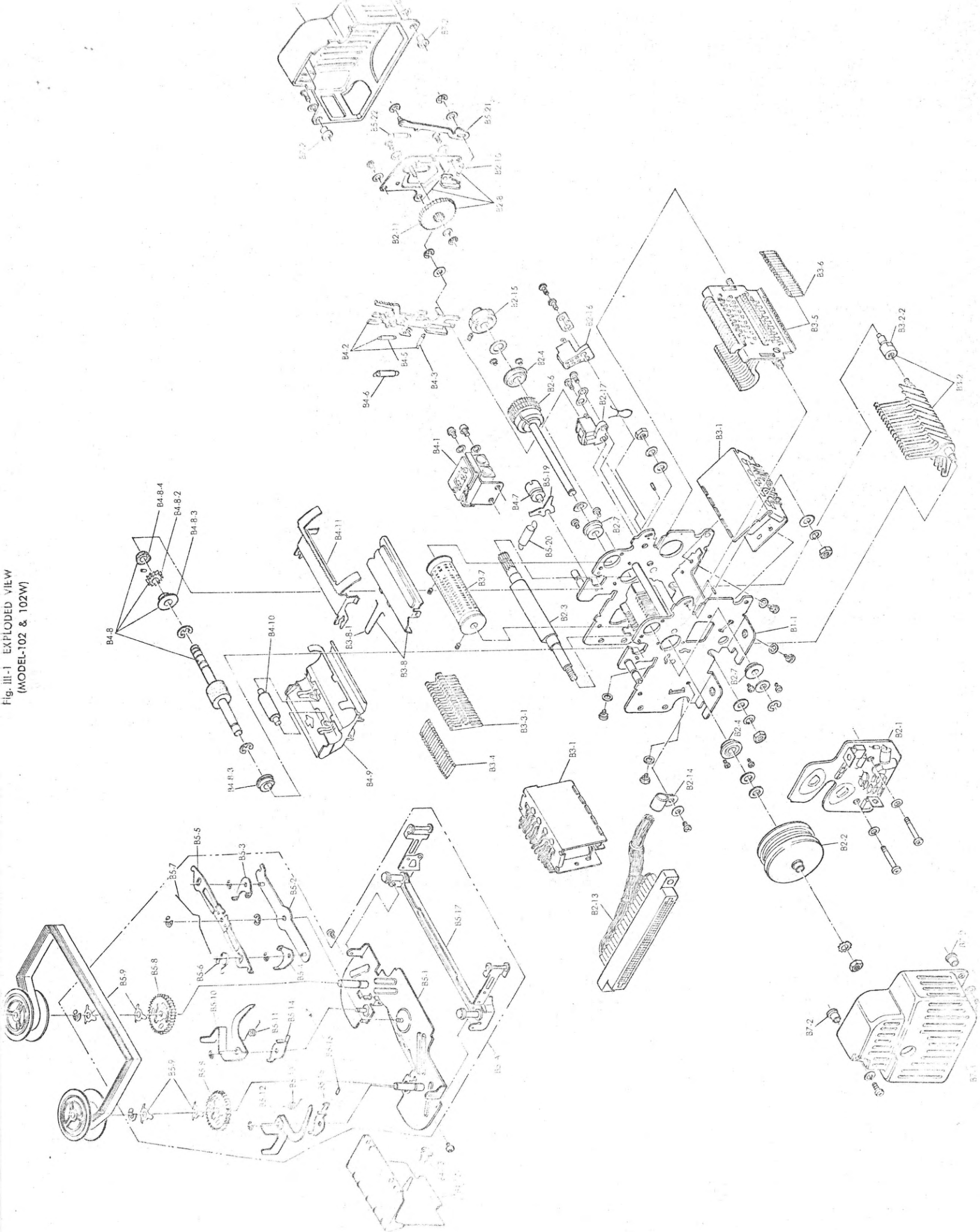
Refer to IV PARTS LIST for parts identification.

These numbers are also used in Section IV MAINTENANCE AND REPAIR and V DISASSEMBLY AND ASSEMBLY.

Note:

B1-1	Frame
B2-1, 2, 3	Drive components
B3-1, 2, 3	Printing components
B4-1, 2, 3	Paper feeding components
B5-1, 2, 3	Ribbon feeding components
B7-1, 2, 3	Covers

Fig. III-1 EXPLODED VIEW
(MODEL-102 & 102W)



IV MAINTENANCE AND REPAIR

1. Maintenance

Follow the maintenance instruction as described below, and the printer will keep the initial performance for a long time.

1-1 Cleaning

The printer should be cleaned with a brush to remove paper chips and dust after using 10 rolls of paper (or after 3 months).

- (1) For removing paper chips, dust and naps, it is desirable to clean the inside with a vacuum cleaner.
- (2) The type faces of the print drum should be completely cleaned with a hard-bristle brush to maintain initial clear printing.
- (3) Use alcohol and benzine to clean the printer. Thinner, trichloroethylene, ketone, etc. may damage the plastic parts.
- (4) After cleaning, pay attention to the quantity of oil and if necessary, lubricate the oil.

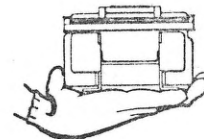
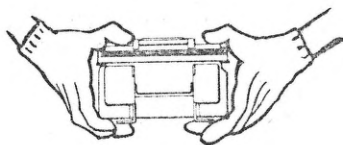
1-2 Replacement of Ribbon

- (1) Replace the black-and-red inked ribbon after using 5 to 8 rolls of paper (or after 6 months). When using only a black inked ribbon, service life of the ribbon is prolonged by 50 to 100%.
- (2) A nylon or vinylon ribbon is recommended because of their clear printing, durability and cost.
- (3) If the inside diameter of the spool for the inked ribbon is too small to operate smoothly with the spool shaft, replace the inked ribbon.
- (4) When replacing the inked ribbon, confirm the ribbon setting direction.
- (5) Before starting the motor, make sure that the inked ribbon stretches tightly. Rotating the motor with loose ribbon will cause the ribbon to wind around the print drum.

1-3 Precaution

Handling

- When carrying a printer without packing case, hold it from the bottom and the sides as shown in the fig. with gloves or finger stalls.



- Be careful not to drop the printer nor bump against each other.

Keeping

- Avoid the place where dust and chip easily adhere. Also avoid to expose the printer

directly to the sunlight or high humidity.

- Keep the printer in a polyethylene bag with Vapor Phase Inhibitor (VPI) to prevent rust.

Mounting

- When mounting the printing mechanism, insert the rubber buffer between the mounting plate of the printer and your equipment to absorb the printing action vibration. Without the buffer, noise will increase reflecting against the housing case of the equipment.

Using

- Utilizing many permanent magnets and electromagnets, iron filings are easily attracted to the printer. Never use in an environment where iron filings easily adhere.
- Do not attempt printing without inserting paper. When printing without paper for an extended period, this practice will cause wear and damage to the print drum, the hammer and the inked ribbon.
- When printing is postponed over a long period, rotation of the print drum should be stopped. Although the rotating gear wheel and the shaft are very durable, excessive continuous rotation will cause the bearing parts to wear which, in turn, will produce noise.

Repairing

- When using or repairing, in the following cases, it is feared that the teeth of the idler gear pinion should be broken, and phase lag or bad tone quality should occur.

- 1) The vertical motion of the paper feeding lever are not performed smoothly.
- 2) Timing of paper feeding pulse does not agree with the time chart. (continuous energizing)

1-4 Periodical Checking

When cleaning or checking, check the following points.

1) Ribbon mechanism

- a. Each lever and the spool gear operate smoothly.
- b. Return of ribbon feed

Space between the periphery of spool shaft and the detecting lever $5.0 \pm 0.3 \text{ mm}$

- c. Ribbon feed condition

2) Lubricating

Refer to VII ANNEX 1 for lubricants, and apply oil to the following parts.

M-1, 7, 8, 9, 14, 15

R-9 ~ 23

3) Shape of the spring hook

Especially the hammer lever spring

4) Operation of the hammer

5) Operation of the tension lever

6) Loading of the print drum



7) Loosening of the screws

2. Repair

Repair is classified into three standards (A, B, and C) according to the difficulty involved.

2-1 Repair Standards

- A: General knowledge of construction and operating principle of the printer as well as basic technique of repair is necessary. No special experience nor trained skill is required.
- B: Thorough knowledge of construction and operating principle of the printer is necessary. Techniques for handling jigs and measuring instruments in disassembling and assembling as well as repair experience are requisite.
- C: Expert knowledge of construction and operation principle of the printer is demanded. High trained skill and techniques for handling special jigs and measuring instruments as well as thorough experience in repair are necessary.

2-2 Repair Procedures

Should trouble occur, refer to 3. Repair Manual to ascertain exactly what is wrong; then proceed as follows:

- 1) Search for and determine the "Trouble".
- 2) Identify the "Troubled condition".
- 3) Locate the "Cause". Refer to 2-1 Repair Standards.
- 4) Examine the "Check point" and follow the checking method specified.
- 5) Repair according to instructions under the "Repair" column. If the trouble is not remedied after repair, check another "Cause" and try again.

To identify the parenthesized parts numbers in 3. Repair Manual refer to chap. III, EXPLODED VIEWS.

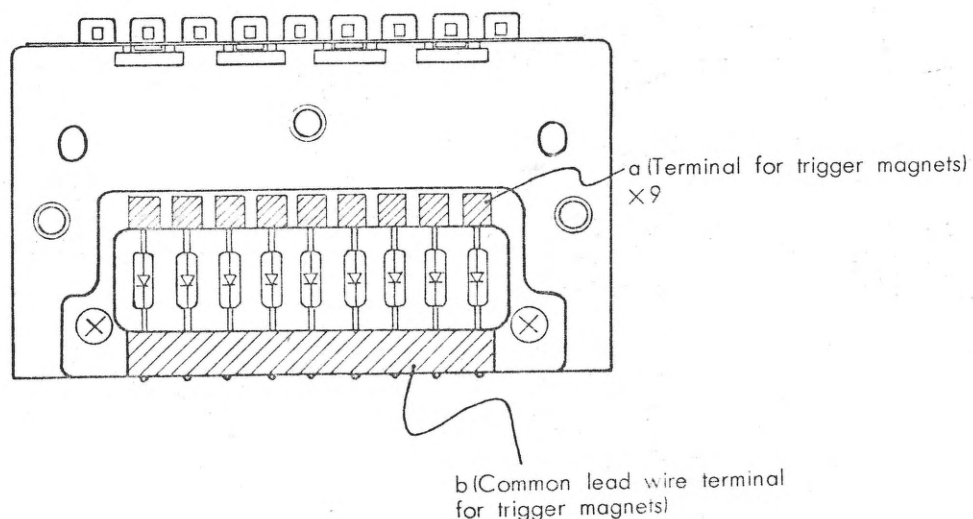


Fig. IV-1 TRIGGER MAGNET ASSEMBLY

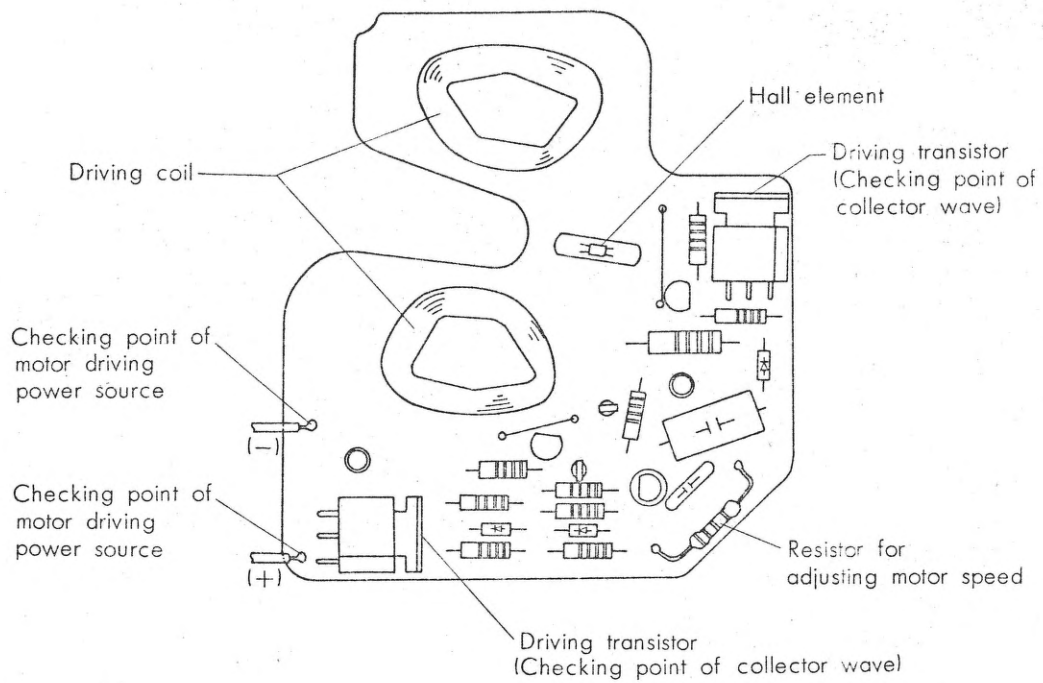
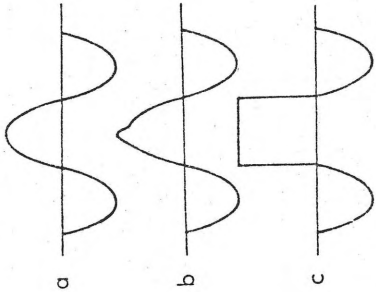
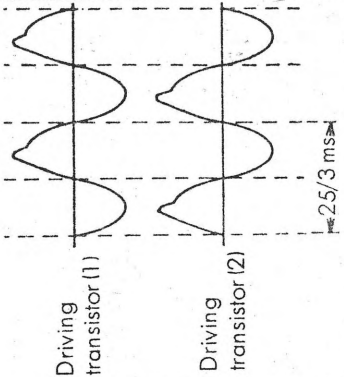


Fig. IV-2 MOTOR CIRCUIT UNIT

3. Repair Manual

TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
1. Motor does not rotate.	Motor does not drive after switching ON, and train gears and print drum do not start even when turned manually.	(1) Power source in control circuit is defective.	A	*Adjust input terminal of connector with wires (B2-13). Connect terminal number #14 to +terminal of voltmeter, terminal number #12 to -terminal of voltmeter. Rated voltage: $17 \pm 2V$ see Fig. I-3.	*Repair power source in your control circuit.
		(2) Loose contact of connector with wires (B2-13).	B	*Check if contact spring of connector with wires (B2-13) is distorted or dirty.	*If distorted, replace with new ones. See V-1-5 and V-2-11 *If dirty, clean with benzine.
		(3) Soldering of lead wires of connector with wires (B2-13) is disconnected.	A	*Check lead wires by pulling it gently.	*Solder firmly, using a soldering iron of about 20 to 30 W. *Be careful not to contact the neighboring terminals.
		(4) Wiring of motor circuit unit (B2-1) is disconnected.	B	*Check source lines of motor circuit unit. See Fig. IV-2. Rated voltage: $15 \pm 2V$	*If wiring is disconnected, replace connector with wires (B2-13).
		(5) Rotor assembly (B2-2) is defective.	A	*Check if metal fillings are adhered to ferrite magnets of rotor assembly. *Rotate the rotor with holding the ratchet released to check if the rotor is firmly fixed to the rotor shaft.	*Remove with cellophane tape. *Tighten a left-handed hexagonal nut firmly. Fixing torque: 24 kg·cm

TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
				*Check if there is contact between ferrite magnet of the rotor assembly and motor circuit unit (B2-1).	*Adjust its position by inserting a washer into the fixing part of the motor circuit unit. *A deformed motor circuit unit should be replaced with a new one according to V-1-6 and V-2-10 and then adjust its motor speed.
		(6) Rotating mechanism is defective.	A B C	*Turn print drum assembly (B3-7) manually to confirm if it rotates smoothly. *Check if dust is adhered to gear wheels. *Check if ferrite magnets buried in print drum gear with shaft assembly (B2-6) and detecting wheel T (B2-15) are contacting detectors (B2-16 and B2-17). *Check for excessive meshing of gear wheels caused by displacement of idler gear unit (B2-8). *Check if teeth of gear wheel are chipped. *Check if dust is adhered to ratchet shaft (B2-3). *Check if chips are stuck between print drum assembly (B3-7) and paper guide assembly (B4-9) *Check if setscrews for print drum are loosened.	*Remove dust completely. (A) *In correcting position of detectors, first loosen the setscrew. See V-2-9. (B) *Correct position of idler gear unit, or replace a gear. See V-2-13. (C) *Replace gear wheel. See V-1-3 and V-2-13. (C) *Remove dust completely. (A) *Remove dust carefully. (A)

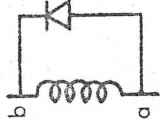
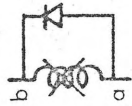
TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
2. Motor does not selfstart.	Motor rotates only when turned over manually.	(1) Motor circuit unit (B2-1) is defective.	B	*Use an oscilloscope to check wave forms of collectors (on motor circuit board Fig. IV-2). 1. Check if wave form A or B generates. 2. Check period of wave form. Within 25 ± 2 msec. 3. Apply load to motor. If wave form like C appears, speed control circuit in motor circuit board is perfect. 4. Check if current consumption of motor in stand-by is less than 160 (*200) mA. 5. Change voltage from 12V to 18V and check period of wave form. 6. Print 18 columns at 15V and check if mean current consumption is within 490 (*550) mA.	*If wave form A or B is not observed replace motor circuit unit (B2-1) and adjust motor speed. See V-1-6 and V-2-10. *For adjusting motor speed replace resistor which determines motor speed (Fig. IV-2). *Rated motor speed 25 ± 2 msec/rev. (at no-load, 15V DC, 25°C) To measure motor speed, measure period of timing signal TP_n to TP_{n+1}.  a b c  Driving transistor (1) Driving transistor (2) 2.5/3 ms Voltage wave form of collector Driving wave form of motor

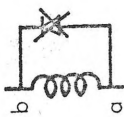
TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
3. Irregular rotation	Irregular printing speed and nonuniform printing	(2) Input power source voltage is too low.	A	See TROUBLE 1-CAUSE (1).	
		(3) One of the two phases does not operate properly.	B	See TROUBLE 2-CAUSE (1).	
		(4) Ratchet shaft does not rotate lightly.	C	See TROUBLE 1-CAUSE (6).	
		(1) Motor circuit unit (B2-1) is defective.	B	See TROUBLE 2-CAUSE (1).	
		(2) Loosened hexagon nut for rotor.	A	*While holding ratchet shaft (B 2-3), turn rotor to check if it rotates.	*While holding ratchet shaft, tighten hexagon nut for rotor (left-handed) at 24 kg·cm torque.
4. Slow motor speed	No printing, or printing is light and thin due to too slow motor speed.	(3) Rotating mechanism is defective.	A, B	See TROUBLE 1-CAUSE (6)	
		(4) Input power source of motor is defective.	A	See TROUBLE 1-CAUSE (1).	
		(5) Impedance of power circuit for motor is too high.	A	*Change it to the lower impedance (below 0.5Ω)	*If impedance is too high, lower it below 0.5Ω.
		(1) Speed of motor circuit unit (B2-1) is defective.	B	See TROUBLE 2-CAUSE (1).	
		(2) Loosened hexagon nut	B	See TROUBLE 3-CAUSE (2).	

TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
		for rotor.			
		(3) Input power source of motor is defective.	A	See TROUBLE 1-CAUSE (1).	
		(4) Impedance of power circuit for motor is too high.	A	See TROUBLE 3-CAUSE (5).	
5. Excessively fast motor speed.	Irregular printing due to excessive motor speed.	(1) Motor circuit unit (B2-1) is defective.	B	See TROUBLE 2-CAUSE (1).	
		(2) Input power source voltage is too high.	A	See TROUBLE 1-CAUSE (1).	
6. Rotational speed decreases when starting to print.	Rotational speed decreases by over 20% when starting to print.	(1) Motor circuit unit (B2-1) is defective.	B	See TROUBLE 2-CAUSE (1).	
		(2) Input power source of motor is too low.	A	See TROUBLE 1-CAUSE (1).	
		(3) Impedance of power circuit for motor is too high.	A	See TROUBLE 3-CAUSE (5).	
		(4) Loosened hexagon nut for rotor.	B	See TROUBLE 3-CAUSE (2).	
7. Abnormal noise during rotation.	Abnormal noise generated during rotation.	(1) Chips are adhered.	A	*Check if chips are adhering to rotor assembly (B2-2), train wheel, and print drum assembly (B3-7).	*Remove with cellophane tape.

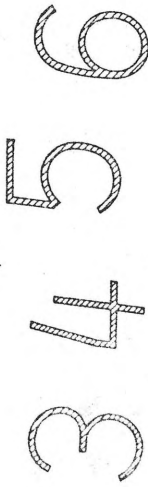
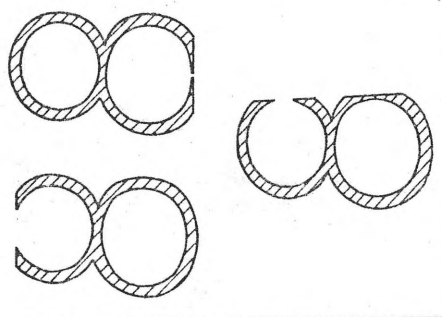
TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHK POINT	REPAIR
		(2) Excessive meshing of idler gear (B2-11).	B	*Move idler gear unit (B2-8).	See V-2-13 items 4.
8. Hammer operates simultaneously when motor is switched on without print command.	Certain hammers print 13 characters continuously in the same column.	(1) Trigger magnet assembly for printing (B3-1) are being energized.	A	*Check trigger signal of the corresponding column. See Figs. I-3 and IV-1.	*If trigger magnets are energized, correct driving control circuit.
		(2) Trigger lever spring (B3-4) is disconnected.	A	*Check disconnected trigger lever spring of the corresponding column.	*Hook spring on spring hook plate with tweezers.
		(3) Trigger lever spring (B3-4) is slack.	A	*Check trigger lever spring of the corresponding column.	*Replace trigger lever spring of the corresponding column.
9. No printing.	Motor rotates normally but hammer does not operate at all.	(1) Loose contact of connector with wires (B2-13).	A	*Check connection of connector terminals #1.	*If contact spring is distorted, replace connector. See V-1-5 and V-2-11 *If contact spring is dirty, clean with benzine.
		(2) Common lead wires of two trigger magnet assemblies (B3-1) are disconnected.	A	*Make continuity check across connector terminal #1 and common terminals (Fig. IV-1) of two trigger magnet assemblies.	*If disconnected, solder firmly or replace wiring.
		(3) Timing signal is in abnormal condition.	B	*Check connection of connector terminals #17.U. *Check wiring between connector terminal and detecting head T (B2-16).	*Clean dirt with benzine. If connector spring is damaged, replace it. *If it is disconnected, solder firmly or replace wiring.

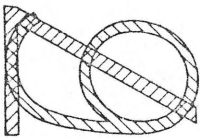
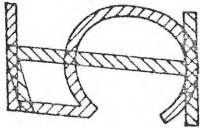
TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
				*Check disconnection, short-circuit, and layer-short of detecting head T. Ohmic resistance of detecting head T: $130 \pm 26 \Omega$ *Check if ferrite magnets for timing signals TP and TL buried in detecting wheel T (B2-15) are damaged.	*Replace detecting head T. See V-1-7 and V-2-9. *If damaged, replace detecting wheel T (B2-15). See V-1-11 and V-2-4.
		(4) Reset signal is in abnormal condition.	B	*Check contact of connector terminals #15.S. *Check wiring between connector terminal and detecting head R (B2-17). *Check disconnection, short-circuit, and layer-short of detecting head R. Ohmic resistance of detecting head R: $3.4 \pm 0.68 k\Omega$ *Check if ferrite magnets buried in print drum gear with shaft assembly are damaged.	*Clean with benzine. If connector spring is damaged, replace it. *If it is disconnected, solder firmly or replace wiring. *Replace detecting head R. See V-1-7 and V-2-9. *Replace print drum gear with shaft assembly. See V-1-8 and V-2-8.
10. Omission of printing in certain columns.	Printing of certain column is omitted continuously.	(1) Loose contact of connector with wires (B2-13).	B	*Check connector terminal of the corresponding column. See Fig. I-3.	See TROUBLE 9-CAUSE (1).
		(2) Lead wire of trigger magnet of the corresponding column is disconnected.	A	*Make continuity check across connector terminal of the corresponding column and terminal a (Fig. IV-1) of trigger magnet assembly.	*If lead wire is disconnected, solder it firmly or replace it.

TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
	000 0000 0000 111 1111 1111 222 2222 2222 333 3333 3333 444 4444 4444 555 5555 5555 666 6666 6666 777 7777 7777 888 8888 8888 999 9999 9999	(3) Coil of trigger magnet is disconnected.	A	*Measure the resistance of corresponding trigger magnet. (i) Normal condition  Resistance in proper direction. (from a to b) 11 Ω approx. Resistance in opposite direction. (from b to a) 80 Ω approx. (ii) Disconnected condition.  Resistance in proper direction. (from a to b) 12 Ω approx. Resistance in opposite direction. (from b to a) ∞	*If resistance is below rated value, replace trigger magnet assembly. See V-1-12 and V-2-3.
		(4) Disconnection or short circuit of trigger magnet diode of the corresponding column.	A	*Measure the resistance of corresponding trigger magnet. (See Fig. IV-1.) (ii) When trigger magnet diode	*If it is short-circuited or disconnected, replace the diode.

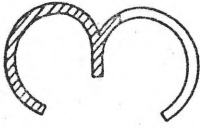
TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
				is disconnected.  Resistance in both proper direction and opposite direction between a and b. $100 \pm 10 \Omega$ (ii) When trigger magnet diode is short-circuited. Resistance in both proper direction and opposite direction between a and b. 0Ω approx.	
		(5) Input trigger pulse is abnormal.	B	*Use oscilloscope to check if input trigger pulse at connector terminal (Fig. I-3) is within standard rating. Trigger pulse standard Voltage: $15 \pm 2V$ Pulse width: 16.3msec min.	*If input trigger pulse is abnormal, correct your driving control circuit.
		(6) Trigger magnet assembly for printing (B3-1) is not attached in position.	A	*Bring actuating plate of corresponding trigger magnet into actuating condition, using connector for checking contact position, check if the end of trigger lever engages with pawl of ratchet shaft.	*Correct the position of trigger magnet so that the engagement of trigger lever and the pawl is within 0.7 mm to 1.5 mm in the actuating condition.

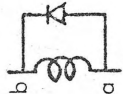
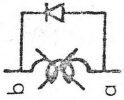
TROUBLE	TROUBLED CONDITION	CAUSE		CHECK POINT	REPAIR
		(7) Hammer lever is broken.	B	*Check if corresponding hammer lever is broken.	*If hammer lever is broken, replace hammer lever assembly (B3-5). See V-1-13-1 and V-2-2.
11. Random omission of printing.	Printing is omitted at random throughout entire columns. 000 000000000 11111111 1111 222222222 22 33 333333333 44 444444444 55555555555 66666 66666 6 7 7777777777 888888 888888 999999999 999	(1) Printing mechanism does not operate properly.	B	*Check oiled condition of actuating lever shaft, trigger lever, trigger lever guide, and hammer lever shaft.	*If oil is lacking, apply more oil. See VII ANNEX.
		(2) Loose contact of connector with wires (B2-13).	A	See TROUBLE 10-CAUSE (1).	
		(3) Trigger lever (B3-3-1) is worn.	C	*Check worn condition of trigger lever.	*If trigger lever is worn, replace trigger lever (B3-3-1). See V-1-10 and V-2-5.
		(4) Pawl of ratchet shaft (B2-3) is worn.	C	*Check worn condition of pawl of ratchet shaft.	*If worn, replace ratchet shaft. See V-1-11 and V-2-4.
		(5) Input trigger pulse is abnormal.	B	Refer to CAUSE (5) of TROUBLE 10.	
12. Irregular printing.	Printing is nonuniform and not aligned.	(6) Disengagement of trigger lever (B3-3), hammer lever (B3-5), and actuating lever (B3-2).	C	*Check bend and engagement of trigger lever and hammer lever. *Check bend and engagement of actuating lever and trigger lever.	*Replace bent parts.
		(1) Paper feeding mechanism is defective.	B	*Measure paper feeding time. Paper feeding time: 75 msec. Pulse width: 25 msec min.	*If feeding time exceeds 75 msec, replace paper feeding spring (B4-6).

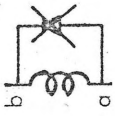
TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
		(2) Paper slides while printing.	C	*Check the strength of spring of paper holding roller bridge.	*If pulse width is excessive, adjust your control circuit. *Strengthen the spring by holding up paper holding roller bridge. *Replace paper guide assembly (B4-8).
		(3) Backlash of train wheel.	B	*While holding rotor (B2-2) rotate print drum (B3-7) back and forth, then check backlash.	*If backlash is evident, adjust bridge for idler gear (B2-8). See V-2-13.
		(1) Pawl of ratchet shaft (B2-3) and print drum do not synchronize each other.	B C	*While holding rotor assembly (B2-2), rotate print drum and check looseness of two setscrews on print drum. *Check looseness of two setscrews for idler gear unit (B2-8). *Fix rotor assembly (B2-2), and check backlash of gear trains by rotating print drum back and forth.	*Tighten setscrews. See V-2-15. *Adjust position of idler gear. See V-2-13. *If teeth of ratchet shaft, idler gear and print drum gear are worn, replace the gear wheels.
		(2) Print drum assembly (B3-7) is shifted in the axial direction.	B	*Move print drum in the axial direction to check looseness of two setscrews.	*Tighten setscrews. See V-2-15.
		(1) Trigger lever spring (B3-6) is slack.	A	*Check the slack of the trigger lever spring.	*Replace trigger lever spring (B3-4).
13. Incomplete printing.	Hammer and type center do not coincide with each other, printing only partial figures.				
14. Over-printing.	Character to be printed overlaps with the neighboring character in the same column				

TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
	due to double operation of hammer. 	(2) Actuating plate is pulled to trigger magnet for a prolonged time. (3) Pulse width of input trigger pulse is not proper. (4) Motor speed is too high.	B B B	*Check if actuating plate returns quickly by pushing it. *Check if fall timing of input trigger pulse synchronizes with timing signal TL. *To check the speed, measure wave form of driving transistor of motor circuit unit (B2-11). Rated speed: 25 ± 2 msec/rev. (no-load, 15VDC, 25°C)	*If it does not return quickly, clean the adhered oil with benzene. *Adjust pulse width of input trigger pulse. *Adjust motor speed. See TROUBLE 2-CAUSE (1).
15. Over-printing of another character.	Character to be printed overlaps with a character other than the neighboring one due to double operation of hammer. 	(5) Trigger lever does not operate properly. (1) Input trigger pulse is abnormal.	C A	*Check if trigger lever operates lightly. *Check input trigger pulse at terminal of connector with wires (B2-13).	*Clean and apply oil. See V-1-10 and V-2-5. *Adjust input trigger pulse.
16. Ghost printing.	Ghost printing.	(1) Motor speed is too high.	B	Refer to CAUSE (4) of TROUBLE 14.	

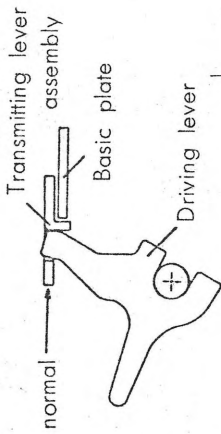
TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
17. Blurred printing.		(2) Hammer lever spring (B3-6) is slack.	A	*Check slack of hammer lever spring (B3-6).	*Replace hammer lever spring.
		(3) Trigger lever spring is slack.	A	*Check slack of trigger lever spring (B3-4).	*Replace trigger lever spring.
		(1) Inked ribbon (B5-23) becoming dried out.	A	*Check inked ribbon.	*Replace inked ribbon (B5-23).
		(2) Inked ribbon (B5-23) does not feed.	A	*Check ribbon feeding mechanism. Refer to TROUBLE 23.	
		(3) Type on print drum (B3-7) is worn.	B	*Check worn type.	*Replace print drum. See V-1-8 and V-2-8, 15.
		(4) Hammer is worn.	B	*Remove hammer lever assembly (B3-5) according to V-1-13, and check worn hammer.	*Replace hammer lever assembly (B3-5). See V-1-13-1 and V-2-2.
		(5) Motor speed is too low.	B	*Measure wave form of driving transistor in motor circuit board and check the speed. Rated speed: 25 ± 1 msec/rev. (no-load, 15VDC, 25°C)	*Adjust motor speed. See TROUBLE 2-CAUSE (1).
		(6) Moving parts are worn.	C	*Check wear of the following parts:	*If trigger lever is worn, replace trigger lever.

TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
				• Trigger lever (B3-3) • Pawl of ratchet shaft (B2-3). • Supporting bushing for hammer lever unit.	See V-1-10 and V-2-5. *If ratchet shaft is worn, replace ratchet shaft (B2-3). See V-1-11 and V-2-4. *If supporting bushing for hammer lever is worn, replace hammer lever assembly (B3-5). See V-1-13-1 and V-2-2.
		(7) Oil depleted.	A	*Check oiling condition of ratchet shaft unit (B2-3), trigger lever (B3-3), trigger lever guide and hammer lever shaft.	*If oil is lacking, apply more of oil specified. See VII ANNEX.
		(8) Trigger magnet assembly for printing (B3-1) is not attached in position.	B	Refer to CAUSE (6) of TROUBLE 10.	
		(9) Unsuitable paper being used.	A	*Check thickness and surface roughness of paper.	*Replace with thin and fine quality paper.
		(1) Loose tension of inked ribbon (B5-23).	A	*Check looseness of inked ribbon.	*Replace or adjust brake spring. Replace ribbon feeding unit.
		(2) Position of ribbon is not proper.	A	*Check position of ribbon against hammer.	*Correct position of ribbon by moving ribbon guide lever up and down.
		(3) Ribbon shifting is defective.	A	*Check if ribbon shift lever functions lightly.	*Adjust position of trigger magnet assembly for paper feeding.
18. Prints in two colors.	One character printed in two colors. 				

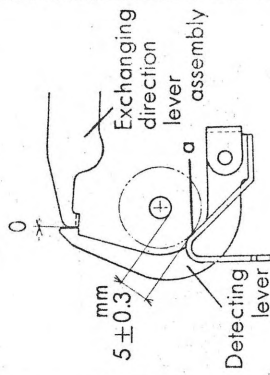
TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
19. Paper does not feed.	Paper does not feed and printing is repeated in the same position.	(1) Loose contact or disconnection of connector with wires (B2-13).	A	*Check disconnection of lead wires of connector terminals #13-P and N. Check contact spring.	*If lead wires are disconnected, solder them. *Clean contact spring with benzine.
		(2) Input voltage for trigger magnet assembly for paper feeding (B4-1) is low or pulse width is narrow.	A	*Measure voltage of connector terminals #13-P and N. Pulse width: 25msec Voltage: $15 \pm 2\text{VDC}$	*If input pulse is not standard, adjust control circuit.
		(3) Lead wires and coil of trigger magnet assembly for paper feeding (B4-1) is disconnected or burnt out.	A	*Measure the resistance between socket terminals #13-P and N of connector with wires (B2-13). (i) Normal condition  Resistance in proper direction. (from a to b) 10 Ω approx. Resistance in opposite direction. (from b to a) 50 Ω approx. (ii) Disconnected condition  Resistance in proper direction.	*If soldered part is disconnected, solder it again. *If wiring and coil are disconnected or burnt out, replace trigger magnet assembly for paper feeding.

TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
				(from a to b) $11\ \Omega$ approx. Resistance in opposite direction. (from b to a) ∞ *Check the soldered part of lead wires of trigger magnet assembly for paper feeding. *Check discoloration of insulating tape of coil of trigger magnet assembly for paper feeding.	
		(4) Trigger magnet diode is disconnected or short-circuited.	A	(i) Normal condition Resistance in proper direction. (from a to b) $11\ \Omega$ approx. Resistance in opposite direction. (from b to a) $50\ \Omega$ approx. (ii) Disconnected condition  Resistance in both proper direction and opposite direction between a and b. $50\ \Omega$ approx. (iii) Short-circuited condition Resistance in both proper direction and opposite direction be-	

TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
20. Irregular pitch of paper feeding.				tween a and b. 0 Ω approx.	
		(5) Paper is not advanced properly.	A	*Check course through which paper is advanced. *Check paper width. Standard width: 58 $\pm$ 1mm	*Adjust it. *Use the paper specified.
		(6) Paper feeding lever assembly (B4-2) does not operate properly.	A B	*Check if paper feeding lever assembly (B4-2) operates smoothly by pushing it down by hand.	*Apply oil specified. See VII ANNEX. *Replace paper feeding lever assembly (B4-2).
		(7) Breakage of paper feeding click (B4-2-6) or paper feeding ratchet wheel (B4-8-2).	C	*Rotating paper feeding ratchet wheel (B4-8-2), check breakage or damage of teeth. *Check breakage of the bent part of paper feeding click (B4-2-6).	*Replace paper feeding ratchet wheel (B4-8-2) and paper feeding lever assembly (B4-2).
	Line space of printing is not 4.24 mm but irregular.	(1) Paper feeding lever assembly (B4-2) does not operate properly.	A	Refer to CAUSE (6) of TROUBLE 19.	
		(2) Paper feeding roller unit (B4-8) does not rotate smoothly.	A B	*Check if paper feeding roller rotates smoothly by moving paper feeding lever assembly (B4-2) up and down by hand.	*Apply O-2 oil to plane bearing. See VII ANNEX. *If bearing is seized, replace plane bearing.
		(3) Spring outside paper guide assembly is slack.	B	*Check slack of spring by pulling inserted paper by hand.	*Adjust spring part of paper guide assembly (B4-9).

TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
21. Paper feeding mechanism and ribbon mechanism do not operate at all.	Although printing mechanism operates normally, paper feeding mechanism and ribbon mechanism do not operate at all.	(1) Loose contact or disconnection of connector with wires (B2-13).	A	Refer to CAUSE (1) of TROUBLE 19.	
		(2) Input voltage for trigger magnet assembly for paper feeding (B4-1) is low and pulse width is narrow.	A	Refer to CAUSE (2) of TROUBLE 19.	
		(3) Lead wires and coil of trigger magnet assembly for paper feeding (B4-1) is disconnected or burnt out.	A	Refer to CAUSE (3) of TROUBLE 19.	
		(4) Disengagement between transmitting lever assembly (B5-2) and driving lever (B5-19).	A	*Check if driving lever (B5-19) is disengaged from transmitting lever assembly (B5-2). 	*Adjust transmitting lever assembly (B5-2) by bending downwards to engage with driving lever (B5-19).
22. Inked ribbon comes off.	Although inked ribbon is set normally, it comes off while printing.	(1) Bend of ribbon guide roller A due to deformation of ribbon guide lever assembly (B5-17).	A	*Check if ribbon guide roller A bent (if it is vertical, the condition is normal).	*Adjust ribbon guide roller A to be vertical by bending ribbon guide lever assembly (B5-17).
		(2) Bend of ribbon guide roller shaft B (B5-17-6).	A	*Check if ribbon guide roller shaft B is vertically set.	*Adjust ribbon guide roller shaft B to be vertical by bending it.

TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
		(3) Slack of brake spring (B 5-9) of ribbon spool.	A	*Check strength of brake spring (B5-9) by rotating spool gear (B 5-8) freely.	*Adjust the strength by bending brake spring (B5-9). *Replace brake spring (B5-9). Torque: 30~50 g·cm
23. No auto-return of ribbon feeding.	Ribbon feeds, but no auto-return action.	(1) Detecting lever G (B5-10) or M (B5-12) is defective in form.	A	*Check if the clearance between part a of detecting lever and spool shaft is 5 ± 0.3 mm, when the extreme points of detecting lever and exchanging direction lever assembly (B5-5) touch each other.	*When the clearance is 5 ± 0.3 mm, adjust engagement between exchanging direction lever and detecting lever to be zero by bending part a of detecting lever.
		(2) Slack of exchanging direction spring (B5-6).	A	*Check operating conditions at two stationary points by operating exchanging direction lever assembly (B5-5) by hand.	*Adjust exchanging direction spring (B5-6). *Replace exchanging direction spring (B5-6).
24. Noise audible.	Abnormal noise while non-printing.	(1) Rotary parts contacting fixed parts or other rotary parts.	A B C	*Check if rotary parts— •motor mechanism •ratchet shaft •train wheels •print drum —contact fixed parts or other	*If parts are warped, correct them. *If the position is incorrect, adjust it by inserting washer. *If the parts are worn or damaged, replace them.



TROUBLE	TROUBLED CONDITION	CAUSE	REPAIR STANDARD	CHECK POINT	REPAIR
				rotary parts.	
		(2) Chips are adhered.	A	*Check if chips are adhered to rotary parts.	*Remove chips.
		(3) Gears of ratchet shaft (B2-3), idler gear (B2-11), and print drum gear do not engage properly or are worn out.	B	*Check meshing of gear wheels.	*Loosen setscrew for idler gear unit and adjust position. *If teeth are worn, replace gear wheel.
		(4) Bearing is defective.	C	*Remove idler gear, then check noise from the bearing race when only motor is rotating.	*Replace bearing.

V DISASSEMBLY AND ASSEMBLY

When repairing and overhauling for the printer, perform it in accordance with the following procedures.

NO.	1. DISASSEMBLY	2. ASSEMBLY
1	1-1 Covers	2-1 Assembling and set of actuating lever assembly
2	1-2-1 Removal of the ribbon mechanism	2-2 Assembling and set of hammer lever unit
3	1-2-2 Disassembling of ribbon feeding unit(B5--A)	2-3 Trigger magnet assemblies
4	1-3 Idler gear unit	2-4 Ratchet shaft and detecting wheel T
5	1-4 Paper feeding mechanism	2-5 Trigger levers
6	1-5 Connector with wires	2-6 Adjusting of engagement
7	1-6 Motor	2-7 Paper guide assembly
8	1-7 Detector	2-8 Print drum assembly
9	1-8 Print drum assembly	2-9 Detector
10	1-9 Paper guide assembly	2-10 Motor
11	1-10 Trigger levers	2-11 Connector with wires
12	1-11 Ratchet shaft	2-12 Paper feeding mechanism
13	1-12 Trigger magnet assemblies	2-13 Idler gear unit
14	1-13-1 Removal of hammer lever unit	2-14-1 Assembling of ribbon feeding unit
15	1-13-2 Disassembling of hammer lever unit	2-14-2 Set of the ribbon mechanism
16	1-14-1 Removal of actuating lever assembly	2-15 Position alignment of print drum
17	1-14-2 Disassembling of actuating lever assembly	2-16 Covers

Note: The following method is explained concerning 102.

As for 102W, carry out the DISASSEMBLY AND ASSEMBLY referring to VI PARTS LIST.

1. Disassembly

1-1 Covers

DISASSEMBLY PROCEDURES	REMARKS
1. Remove tension lever (B4-12). 2. Remove retaining ring TYPE-E 2.3 fixing ribbon shift lever (B5-21) and ribbon guide lever (B5-17). 3. Remove ribbon guide lever (B5-17) from ribbon shift lever pin, and raise the lever towards ribbon mechanism side. 4. Remove the setscrews for gear cover (two C.P. screws 3×8 and two plane washers 3-0.5-8). 5. Remove gear cover (B7-1). 6. Remove motor cover (B7-3) in the same way as 4, 5. 7. Remove paper cutter lever (B4-11). 8. Remove print drum cover (B3-8).	* Be careful not to miss paper tensionspring (B4-3). * Do not bend ribbon guide lever when removing retaining ring TYPE-E. * Leave rubber bushing on the cover. * When paper cutter lever is too tight, widen the tale of the lever.

1-2-1 Removal of the ribbon mechanism

1. Remove driving lever spring (B5-20). 2. Remove setscrews for ribbon feeding unit (two C.P. screws 2.5×6) 3. Remove ribbon feeding unit (B5-A). 4. Remove driving lever (B5-19) and driving lever spring (B5-20). 5. Remove ribbon shift spring (B5-22). 6. Remove plane washer 3-0.5-6 and retaining ringTYPE-E 2.3 from paper feeding lever guide shaft. 7. Remove ribbon shift lever (B5-21).	* Be careful not to straighten the hooked part of the spring.
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1-2-2 Disassembling of ribbon feeding unit (B5-A)

1. Remove ribbon guide lever (B5-17) from ribbon feeding unit (B5-A). 2. Remove retaining ring TYPE-E 3 fixing spool gear (B5-8) (right and left). 3. Remove two brake springs (B5-9) (right and left). 4. Remove spool gears (B5-8) (right and left). 5. Remove hook lever springs (B5-15) from hook levers (right and left). 6. Remove retaining ring TYPE-E 2.3 fixing detecting lever (right and left).	* Bend the end of basic plate assembly (B5-1) upwards for easy removal. * Be careful not to straighten the hooked part.
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DISASSEMBLY PROCEDURES	REMARKS
- Remove detecting levers G (B5-10) and M (B5-12) and detecting lever springs G (B5-11) and M (B5-13) at the same time. - Remove hook lever G (B5-14) and M (B5-16). - Remove exchanging direction spring (B5-6) from the pins of transmitting lever (B5-2) and exchanging direction lever (B5-5). - Remove ribbon feeding pawl spring (B5-7) from projection of exchanging direction lever (B5-5) (3 points) and the holes of ribbon feeding pawls G (B5-3) and M (B5-4). - Remove retaining ring TYPE-E 3 from transmitting lever shaft. - Remove exchanging direction lever (B5-5). - Remove retaining ring TYPE-E 3 from transmitting lever shaft. - Remove transmitting lever shaft (B5-2). - Remove retaining ring TYPE-E 2.3 fixing ribbon feeding pawls to transmitting lever (B5-2). (right and left) - Remove ribbon feeding pawls G (B5-3) and M (B5-4).	

1-3 Idler gear unit

- Remove gear cover (B7-1) and ribbon shift lever (B5-21) according to 1-1 and 1-2-1. - Remove the setscrews for idler gear unit (three C. P. screws 3×6 and three plane washers 3-0.5-6). - Remove idler gear unit (B2-8). - Remove retaining ring TYPE-E 2 and plane washer 3-0.2-5 fixing idler gear (B2-11) to bridge for idler gear assembly (B2-9). - Remove idler gear (B2-11).	
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1-4 Paper feeding mechanism

- Remove gear cover (B7-1), motor cover (B7-3), ribbon shift lever (B5-21) and idler gear unit (B2-8) according to 1-1, 1-2-1 and 1-3. - Remove retaining rings TYPE-E 4 for paper feeding roller shaft (right and left). - Move two plane bearings (B4-8-3) inwardly from frames G and M. - Lift and remove the paper feeding roller unit (B4-8). - Remove driving lever shaft (B4-7). - Remove retaining ring TYPE-E 4 and plane washer 5-0.3-10 for paper feeding lever guide shaft (B3-2-2).	* Do not hurt the bearing. * Use (—) driver,
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DISASSEMBLY PROCEDURES	REMARKS
- Remove paper feeding spring (B4-6). - Remove paper feeding lever assembly (B4-2).	

1-5 Connector with wires

- Remove gear cover (B7-1) and motor cover (B7-3) according to 1-1. - Remove the lead wires of detecting heads (B2-16, B2-17). - Remove the lead wires (3 wires) of trigger magnets for paper & ribbon feeding (B4-1). - Remove the lead wires (2 wires) of motor circuit unit (B2-1). - Remove the lead wires of the trigger magnet assembly for printing (B3-1). - Remove C.P. screw 3×8 and plane washer 3-0.5-8 fixing wires holding clip (B2-14). - Remove connector with wires (B2-13).	* Detach it quickly using approx. 20~30 W soldering iron.
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1-6 Motor

- Remove motor cover (B7-3) and the lead wires according to 1-1 and 1-5. - Remove setscrews for motor circuit unit (two C.P. screws 3×18 and two plane washers 3-0.5-8). - Remove motor circuit unit (B2-1). - Remove idler gear unit (B2-8) according to 1-3. - Remove fixing nut for the rotor (Hexagon nut L4 and out side toothed lock washer 4). - Remove rotor assembly (B2-2) from the ratchet shaft (B2-3). - Remove plane washer 7-0.1~0.5 from ratchet shaft (B2-3).	* Take it out carefully not to contact the rotor. * Use a gear driver to prevent ratchet shaft from rotating. * Since the rotor has strong magnetic force, take care that iron filings do not adhere after removal. * When replacing motor circuit unit and the rotor, it is necessary to make a speed adjustment of motor after they are built in.
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1-7 Detector

- Remove gear cover (B7-1) according to 1-1. - Remove the lead wires of detecting head T and R (B2-16, B2-17) according to 1-5. - Dismantle detecting heads T and R by removing its setscrews (C.P. screws 3×6 and plane washers).	* Detach it quickly using approx. 20~30 W soldering iron.
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1-8 Print drum assembly

DISASSEMBLY PROCEDURES	REMARKS
1. Remove the covers according to 1-1. 2. Remove the ribbon mechanism according to 1-2-1. 3. Remove idler gear unit (B2-8) according to 1-3. 4. Remove detecting heads T and R according to 1-7. 5. Loosen setscrews for print drum (H.F. screw 4×5) on frame G side. 6. Loosen setscrews for print drum (H.D. screw 4×5) on frame M side. 7. Remove retaining ring TYPE-E 4 and plane washer 5-0.3-10 on frame M side. 8. Take out print drum gear assembly (B2-6) from frame G side. 9. Remove leaf spring 5-0.1 from print drum shaft. 10. Remove the print drum (B3-7). 11. Remove four C.P. bind screws from both frames, then remove the plain bearings A.	* In case of the shaft could not be taken out, hold the print drum and take it out, turning its shaft. Do not wrench the shaft to take it out, otherwise the bearing and the frame will be damaged with excessive strain.

1-9 Paper guide assembly

1. Remove the following parts according to the disassembling method: 1-1. Covers 1-2-1. Ribbon mechanism 1-3. Idler gear unit 1-7. Detector 1-8. Print drum assembly 2. Remove the paper guide assembly (B4-9).	* Remove it, pulling it out backward (to ribbon feeding unit side).
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1-10 Trigger levers

1. Remove respective parts according to 1-9. 2. Remove 18 trigger lever springs (B3-4) from the hooked part of trigger lever guide (B1-1-5). 3. Take out trigger lever assembly (B3-3) from the trigger lever guide (18 pcs).	* Be careful not to straighten springs.
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1-11 Ratchet shaft

DISASSEMBLY PROCEDURES	REMARKS
1. Remove the paper feeding mechanism according to 1-4. 2. Remove the motor mechanism according to 1-6. 3. Remove Detecting heads T and R according to 1-7. 4. Loosen setscrew for detecting wheel T (B2-15) (H.C. screw 4×5), then remove the detecting wheel T. 5. Remove two C.P. bind screws 2×4 of miniature bearing with flange 7×14 (B1-2) on frame M side, and then remove miniature bearing with flange 7×14. 6. Take out ratchet shaft (B2-3) toward frame M side.	* When taking out the bearing be careful not to scratch it, not to stick dirt, or not to bend it.

1-12 Trigger magnet assemblies

1. Remove all the lead wires of trigger magnet for paper feeding (B4-1) and trigger magnets for printing (B3-1). 2. Remove two setscrews for trigger magnet for paper feeding (C.P. screw with spring lock washer 3×6 and two plane washers 3-0.5-8). then remove the trigger magnet for paper feeding (B4-1). 3. Remove four setscrews for trigger magnets for printing (C.P. screw with spring lock washer 3×6 and four plane washers 3-0.5-8), then remove the trigger magnet assembly for printing A and B.	* Detach it quickly using approx. 20~30 W soldering iron. * Remove the trigger magnets after releasing the engagement between the hooked part of actuating lever and the actuating plate carefully.
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1-13-1 Removal of hammer lever unit

1. Remove gear cover (B7-1) and motor cover (B7-3) according to 1-1. 2. Remove two spring pins 2×6 fixing hammer lever guide to frame assembly. 3. Remove hammer lever unit (B3-5) after loosening two hexagon nuts 4 for hammer lever shaft.	* Push two pins to outside from inside. * Do not disassemble hammer lever unit usually.
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1-13-2 Disassembling of hammer lever unit

1. Remove 18 hammer lever springs (B3-6) from the hook of hammer lever guide and hammer levers A and B. 2. Remove hammer lever guide. 3. Remove Hexagon nut 4, spring lock washer 4, and plane washer 4-0.8-10 from the right and left sides	* Be careful not to straighten the hooked part.
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DISASSEMBLY PROCEDURES	REMARKS
of hammer lever shaft (B3-5-1). 4. Remove hammer guide ring, hammer lever B, plane washer 6-0.2-10, hammer lever A in the above order.	* Do not mistake the order.

1-14-1 Removal of actuating lever assembly

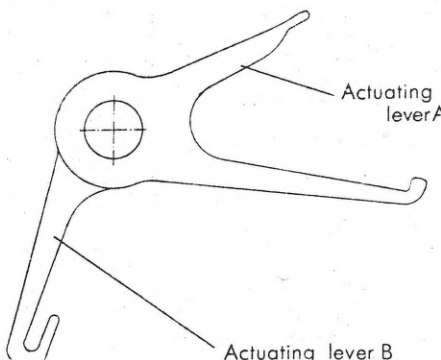
1. Remove gear cover (B7-1) and motor cover (B7-3) according to 1-1. 2. Remove ribbon shift lever and paper feeding lever according to 1-2-1 and 1-4. 3. Remove two trigger magnet assemblies for printing according to 1-12. 4. Loosen the paper feeding lever guide shaft on frame G side of actuating lever shaft and hexagon nut 4 on frame M side, then remove actuating lever assembly (B3-2).	* During and after disassembling, handle actuating lever carefully not to deform it.
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1-14-2 Disassembling of actuating lever assembly

1. Remove paper feeding lever guide shaft on frame G side of actuating lever shaft, actuating lever A, plane washer 6-1.5-9 and actuating lever B in this order.	* Do not mistake the order of actuating levers.
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2. Assembly

2-1 Assembling and set of actuating lever assembly

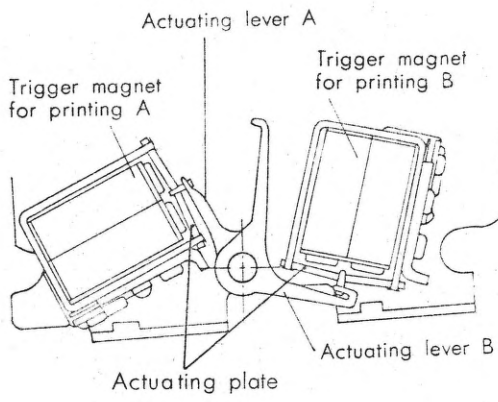
ASSEMBLY PROCEDURES	REMARKS
1. Set actuating lever A, plane washer 6-1.5-9, actuating lever B, plane washer 6-1.5-9,..... in this order while applying G-2 oil to actuating lever shaft from G side. 2. Arrange actuating lever to be in the middle of the shaft, then check if it rotates lightly. 3. Apply G-2 oil to trigger lever guide and actuating lever guide in the frame. 4. Place frame assembly (B1-1) in upside down position. 5. Apply G-2 oil to the striking surface of actuating levers with trigger lever. 6. Arrange actuating levers to be in the middle of the shaft. 7. Arrange each extreme edge of actuating levers A and B separately. 8. Insert actuating lever assembly (B3-2) into the frame, and insert each actuating lever into actuating lever guide one by one. 9. Fix plane washers 4-0.5-10, spring lock washer 4, and hexagon nut 4 to frame M side, and paper feeding lever guide shaft to frame G side, tighten evenly on right and left sides at 24 kg·cm torque.	* Do not make a mistake in the order.  * Lubricate the whole of comb-shaped part. Refer to VII 1 Lubricants M-2 and M-3. * Refer to VII 1 Lubricants M-1. * As for the direction of levers, refer to 2-3. * Do not bend actuating lever guide and actuating lever. * Tighten actuating lever shaft pushing into the open slot fully lest it should float up.

2-2 Assembling and set of hammer lever unit

1. While applying G-2 oil to hammer lever shaft, set hammer guide ring, hammer lever B, plane washer 6-0.1-10, hammer lever A from left to right in this order.	* Do not mistake this order.
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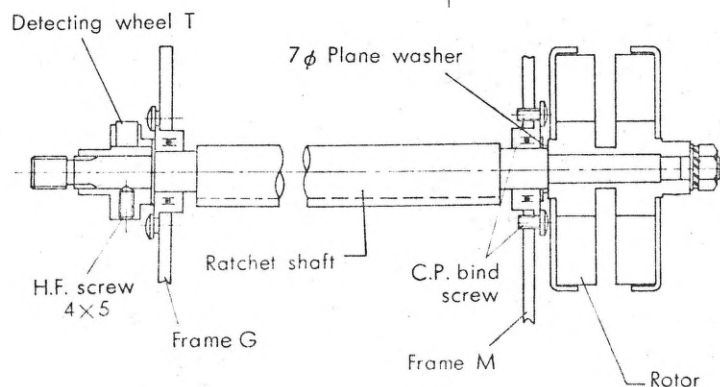
ASSEMBLY PROCEDURES	REMARKS
2. Apply G-2 oil to hammer lever guide. 3. Hook hammer lever spring (B3-6) (18 pcs) to hammer lever and hammer lever guide. 4. Apply G-2 oil to the hook of the spring and the sliding part. 5. Arrange hammer levers in the middle of hammer lever shaft. 6. Insert hammer lever unit (B3-5) into the frame. 7. Push the hammer lever guide fully to the projection on the frame, then insert and fix spring pins 2.6 into the holes on right and left sides of the frame. 8. Tighten the right and left hexagon nuts 4 equally at 24 kg·cm torque. 9. Check 18 hammer levers one by one if they return to their original points smoothly by pushing them softly. 10. Apply G-2 oil to the striking surface at the tale of hammer lever. 11. Apply Neji lock #2 to hammer lever shaft fixing nut (right and left) and the spring pins of hammer lever guide (right and left).	* When hooking the spring, do not deform its hooked part. * Refer to VII 1 Lubricants M-7 to M-9. * Insert both hammer lever shaft and hammer lever guide at the same time. If only the hammer lever shaft is inserted first, the hammer lever spring get out of place. * Tighten it, pushing hammer lever shaft into the open slot to prevent it from floating up. * Push the spring pin into the middle depth with its convergent end forward. * Refer to VII Lubricants M-8.

2-3 Trigger magnet assemblies

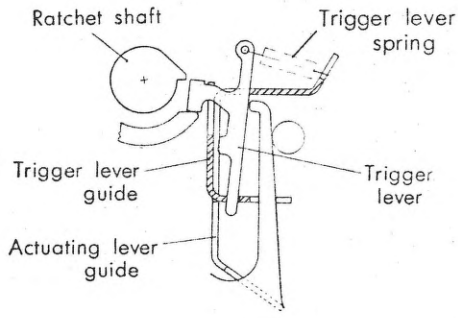
ASSEMBLY PROCEDURES	REMARKS
1. Insert trigger magnet assembly for printing A (B3-1) in to the frame, hook actuating levers to actuating plates, then tighten temporarily with C.P. screw with spring lock washer 3×6 (2 pcs). 2. Tighten temporarily trigger magnet assembly for printing B (B3-1) in the same way as 1. 3. Fix temporarily trigger magnet for paper feeding (B4-1) to frame G side with C.P. screw with spring lock washer 3×6 (2 pcs).	

2-4 Ratchet shaft and detecting wheel T

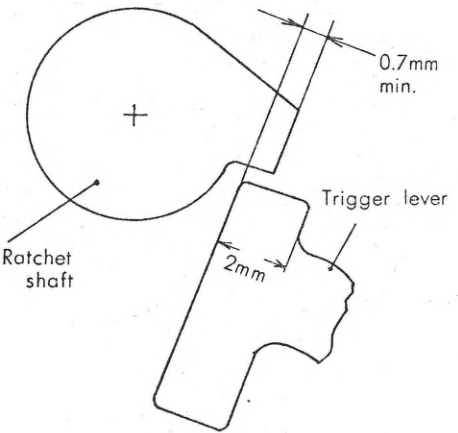
1. Insert the ratchet shaft (B2-3) into the bearings from frame M side to frame G side with the geared end ahead. 2. Put on miniature bearing with flange 7×14 (B2-4) to ratchet shaft, then push it into frame M. 3. Apply Loctite a little to two C.P. bind screws 2×4, then fix the bearing with these screws. 4. Insert plane washer 7-0.5-11 into ratchet shaft on frame G side, then set Detecting wheel T (B2-15) to the spot of ratchet shaft. Apply Loctite to H.C. screw 4×5, and tighten firmly. 5. Confirm if ratchet shaft (B2-3) rotates smoothly. 6. Apply G-2 oil to all surface of ratchet shaft.	* Push it smoothly without wrench or force. * Be careful not to float the bearing. * Do not tighten C.P. bind screws too tightly. (Be careful not to deform the bearings). Tighten the screws enough to contact the flange of the bearing with that of the screw lightly. * The ratchet shaft should be free to move in the thrust direction by its self-weight.
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2-5 Trigger levers

ASSEMBLY PROCEDURES	REMARKS
1. Hook trigger lever spring to trigger lever, then insert them one by one, fitting to the slit and the hole of trigger lever guide. 2. Hook other end of trigger lever springs to trigger lever guide. 3. Apply G-2 oil to the hooked part of the springs.	* Be careful not to straighten the hooked part of the spring.  * Refer to VII Lubricants M-4, 5.

2-6 Adjusting of engagement

1. Use connector for timing adjustment #102, apply 10 ~12VDC current to trigger magnet assembly for printing so that trigger lever engages with ratchet shaft. 2. Loosen setscrews for trigger magnet assembly for printing, slide it forward and backward to adjust the engagement between trigger lever and ratchet shaft to be more than 0.7 mm, then tighten it with two setscrews at 8kg·cm torque. (See the figure at right.) 3. Adjust the other trigger magnet in the same way. 4. Check if trigger levers function quickly by switching power source ON or OFF after adjusting.	* Adjust the position of trigger magnet in OFF condition, then check the engagement in ON condition.  * There should not be clearance between the head of the trigger magnet and the actuating plate in the suction condition.
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2-7 Paper guide assembly

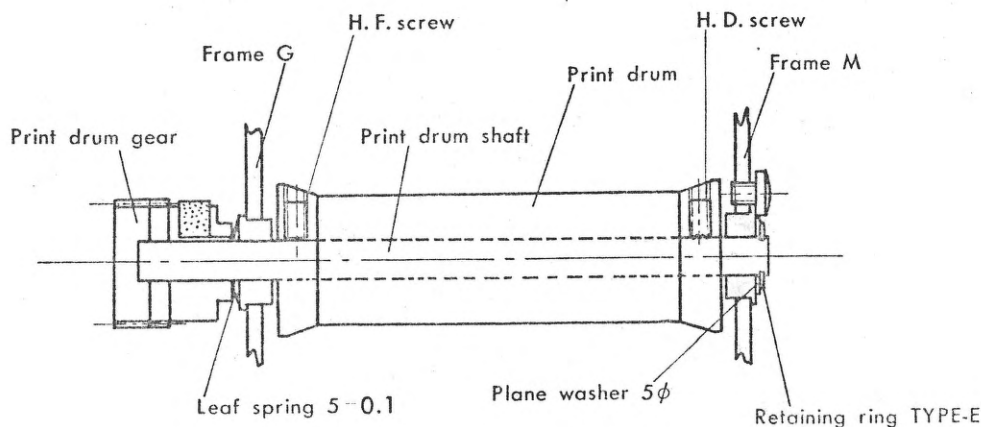
1. Place tails' side of paper guide assembly (B4-9) towards hammer side, fit hooked part of paper guide	* Set hooked part to pins on hammer side first, then push in whole part.
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ASSEMBLY PROCEDURES	REMARKS
to four pins which protruded inside the frame, then push it down to the position where the hook effects perfectly.	

2-8 Print drum assembly

1. Push plane bearings A (B2-7) into frames G and M from the outside respectively.
2. Apply Loctite a little to two C.P. bind screws 3×3, then fix plane bearing A on frame G and M side with these screws at 6 kg·cm torque.
3. Apply 0-2 oil to the both bearings.
4. Place print drum in the recess on the hammer side above paper guide assembly (B4-9) so that figures can be seen in a positive direction from the hammer side.
5. Insert leaf spring 5-0.1 to print drum shaft of print drum gear assembly (B2-6) so that its convex surface is placed on the gear side, then insert the print drum shaft from frame G side.
6. Insert plane washer 5-0.3-10 and retaining ring TYPE-E to print drum shaft projected on frame M side.
7. Tighten temporarily H.F. screw 4×5 on frame G side of print drum (B3-7).
8. Check if print drum shaft rotates smoothly.

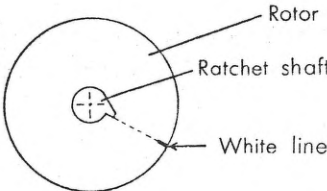
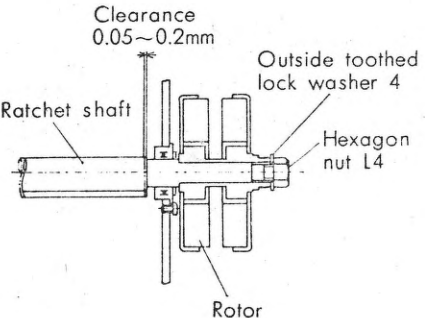
- * Find the position into which plane bearing A can be pushed smoothly by rotating it. Do not apply excessive stress to the bearing.
- * Be careful not to float the bearing.
- * Do not tighten C.P. bind screw too tightly. (Be careful not to deform the bearing.)
- * Tighten the screws enough to contact the flange of the bearing with that of the screw lightly.
- * Refer to VII 1 Lubricants M-14.
- * If the outside circumference of the print drum bush is scratched, it causes a paper sliding noise. Handle it carefully.
- * Insert the bearing without excessive stress.
- * Set retaining ring TYPE-E with its burr side up.



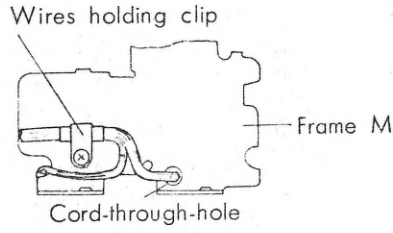
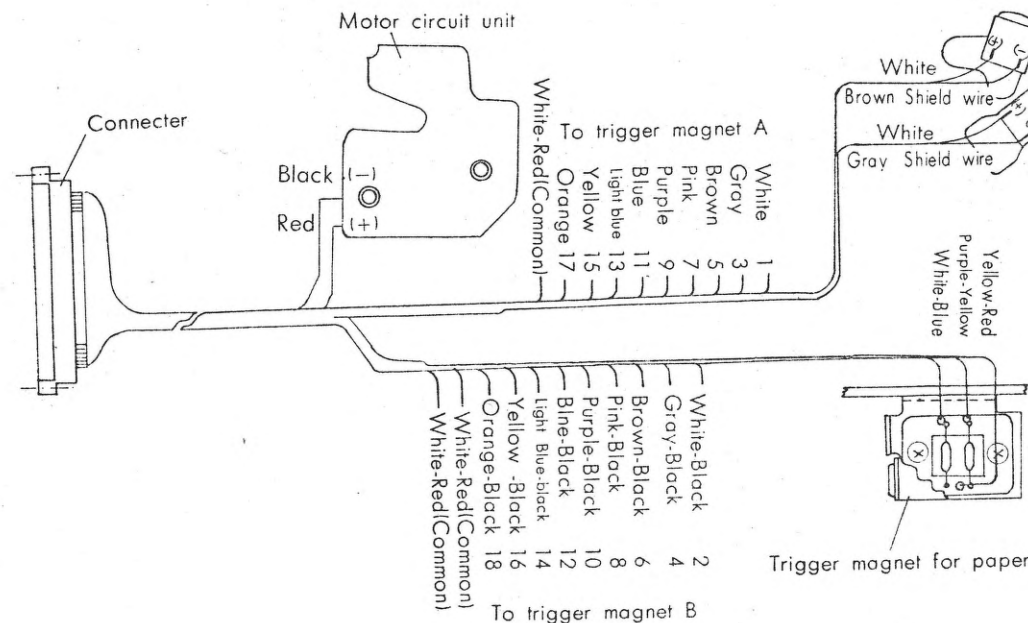
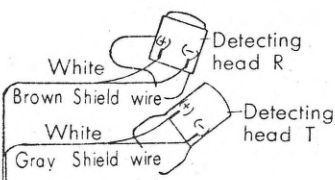
2-9 Detector

ASSEMBLY PROCEDURES	REMARKS
1. Set detecting head T (B2-16) on frame G (B1-1), opposite to detecting wheel T (B2-15), and tighten temporarily with plane washer T and two C.P. screws 3×6. 2. Set detecting head R (B2-17) on frame G (B1-1), opposite to print drum gear, and tighten temporarily with plane washer R and two C.P. screws 3×6. 3. Solder lead wires to detecting heads T and R. (After fixing the connector with wires according to 2-11).	

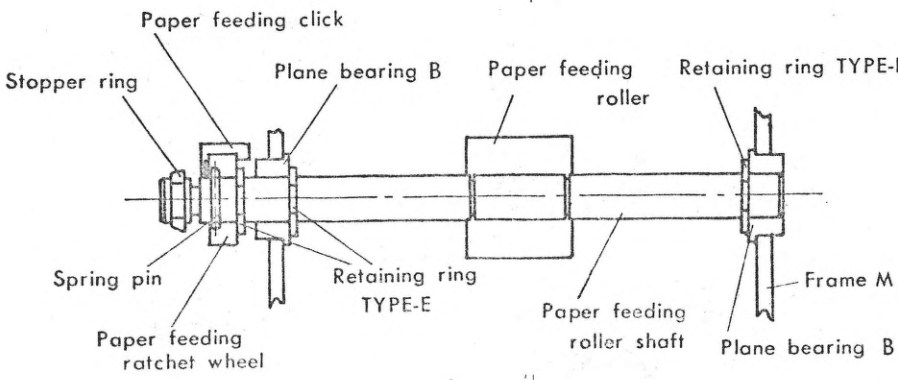
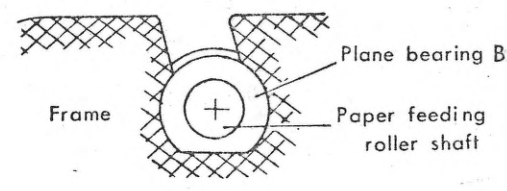
2-10 Motor

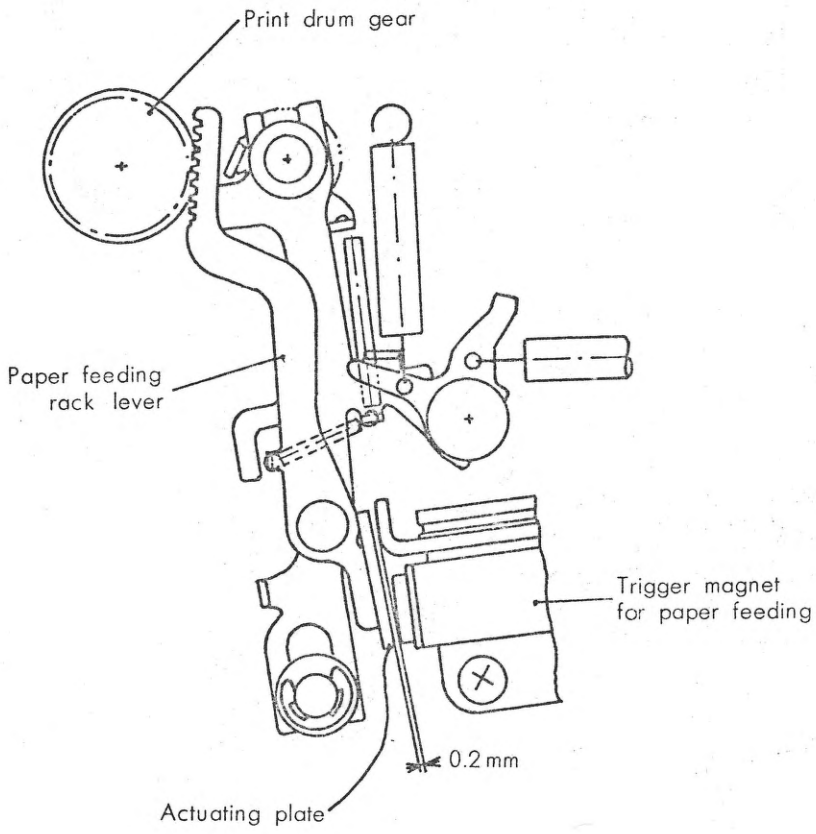
1. Mount plane washer 7φ, rotor assembly (B2-2) and outside toothed lock washer 4 onto ratchet shaft on frame M side. Then tighten with hexagon nut 4 (left handed) at 24 kg·cm torque.  2. Insert motor circuit unit (B2-1) into the gap of the rotor assembly. Put a corner of the board into the groove of the paper cutter lever shaft M, then fix them with two plane washers 3-0.5-8 and two C.P. screws 3×18 at 10 kg·cm torque. 3. Solder lead wires from the connector to the motor board. (After fixing the connector with wires according to 2-11.) 4. Adjustment of motor rotational speed. (1) Observe the collector wave-form of driving transistor on oscilloscope, and measure its period. (2) Adjust resistance so that its rotation period is 25 ± 2.5 msec at 15 ± 2 V. 5. Apply Neji Lock #2 to two setscrews for motor circuit unit. 6. Mount motor cover (B7-3).	* Choose suitable number of plane washer 7φ so as to make axial clearance within 0.05 mm to 0.2 mm. * Fix pawl of ratchet shaft to the white line of rotor assembly.  * Check if unusual noise (rubbing noise) is generated, slanting a printer body to right and left. * Check collector wave-form, at the same time. Refer to "Cause 1" of TROUBLE 2" in "IV-3 Repair Manual" * With reference to the kind of resistor for adjustment, refer to VI "PARTS LIST".
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2-11 Connector with wires

ASSEMBLY PROCEDURES	REMARKS
1. Pass the longer bound cords of connector with wires (B2-13) through the cord-through-hole below frame M, among which longer two lead wires are further passed through the cord-through-hole of frame G. 2. Lead the shorter bound cords of connector with wires from the recess behind the frame M to trigger magnets for printing (B3-1) and trigger magnet for paper feeding (B4-1). 3. Solder lead wires to the motor board. 4. Solder lead wires to the trigger magnet assemblies for printing (B3-1). 5. Solder lead wires to trigger magnet assembly for paper feeding (B4-1). 6. Solder lead wires to the detecting heads T (B2-16) and R (B2-17). 7. Fix the bound lead wires of the connector with wires with wires holding clip (B2-14), then tighten it with plane washer 3-0.5-8 and C.P. screw 3×8 to frame M side. Numbers are column numbers from M side.	 * Be careful not to mistake connector number and column position of the magnet. * Detach it quickly using approx. 20~30 W soldering iron.
	

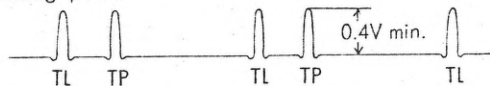
2-12 Paper feeding mechanism

ASSEMBLY PROCEDURES	REMARKS
1. Set the paper feeding lever assembly (B4-2) into supporter of driving lever shaft (B4-7) and paper feeding lever guide shaft on frame G side. 2. Apply Loctite a little to the threaded part of driving lever shaft (B4-7), then tighten it at 15 kg-cm torque. 3. Insert plane washer 5-0.3-10 into paper feeding lever guide shaft, then tighten it with retaining ring TYPE-E 4. 4. Apply G-2 oil to U-shaped slot of paper guide (O) (B4-9-2). 5. Insert paper holding roller (B4-10) into paper guide (O). 6. Check the smooth rotation of paper holding roller (B4-10). 7. Set paper feeding spring (B4-6) between paper feeding lever and paper cutter lever shaft G. 8. Put paper feeding roller unit (B4-8) on the recess of paper guide assembly (B4-9), engage paper feeding ratchet wheel (B4-8-2) with paper feeding click, then push plane bearing B (B4-8-3) into both frames. 9. Insert retaining ring TYPE-E 4 into the right and left slot of paper feeding roller shaft. 10. Check if paper feeding roller unit rotates smoothly by rotating it by hand. 11. Check if the lever rises and falls smoothly by operating it by hand.	* Loctite should be applied a little not to be extruded outwards. * Set plane washer and retaining ring TYPE-E with their burr side out. * Refer to VII 1. Lubricants M-16. * When it does not rotate smoothly, widen the U-shaped slot. * Do not deform the hooked part of spring. * Set plane bearing B, keeping its flanged part inwards. Do not force it into the frame with excessive stress. * Set retaining ring TYPE-E with their burr side towards the center of frame. * Rotate paper-feeding roller reversely, then check if it is locked.
	

ASSEMBLY PROCEDURES	REMARKS
12. Adjust trigger magnet for paper feeding (B4-1). (1) Adjust trigger magnet for paper feeding by moving it so that the clearance between trigger magnet for paper feeding and actuating plate may be 0.2mm in the locked condition. (2) After adjustment, tighten it at 10 kg·cm torque. 13. Apply 0-2 oil to plane bearings B. 14. Apply G-2 oil to sliding parts and shafts of each lever and hooked parts of springs. (Refer to VII 1 Lubricants M-17~31.)	
 The diagram illustrates the paper feeding mechanism. It shows a circular 'Print drum gear' at the top left, connected to a 'Paper feeding rack lever'. This lever is part of a larger assembly that includes a 'Trigger magnet for paper feeding' and an 'Actuating plate'. A dimension line indicates a '0.2 mm' clearance between the trigger magnet and the actuating plate. Various other mechanical components like shafts, bearings, and springs are also depicted.	

2-13 Idler gear unit

1. Fix idler gear (B2-11) to bridge for idler gear (B2-9). (1) Apply G-2 oil to idler gear shaft of bridge for idler gear (B2-9), then insert idler gear (B2-11) into it. (2) Insert plane washer 3-0.2-5 and tighten it with retaining ring TYPE-E 2. (3) Check if idler gear rotates lightly by rotating it by hand.	* Be careful that dust and iron filings do not adhere to idler gear because they cause
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ASSEMBLY PROCEDURES	REMARKS
2. Set detecting head T (B2-16) against ferrite magnet T L of detecting wheel T (B2-15), and set detecting head R (B2-17) against ferrite magnet R of print drum gear with shaft assembly (B2-6). Keeping this condition by hand, set idler gear unit (B2-8). 3. Set plane washers 3-0.5-6 and C.P. screws 3X6 to three shafts, then tighten softly. 4. Phase adjustment of reset signal R and timing signal TL. (1) Rotate motor and check if each pulse is within standard observing timing signal and reset signal simultaneously by 2 channel oscilloscope. (2) Finding the point where sound volume, tone quality, and current are smallest by moving idler gear unit by hand, at this point tighten three setscrews for idler gear unit at 10 kg-cm torque. (3) Loosen setscrews for detector, adjust the phase as the figure at right, then tighten setscrews again at 10 kg-cm torque. 5. Apply Neji Lock #2. Setscrews for detector (4 pcs.) Setscrews for idler gear unit (3 pcs.) Setscrews for trigger magnet for paper feeding (2 pcs.) 6. Apply G-2 oil to tooth surface of the gears.	abnormal noise. * If pulse is unusual, replace detector according to 1-7 and 2-9. * Mean current in nonprinting condition..... 160mA max. * Check if backlash of gear train is too excessive. Timing pulse  Reset pulse  * Refer to I SPECIFICATIONS FIG. I-1. * Refer to VII-2 Adhesives.

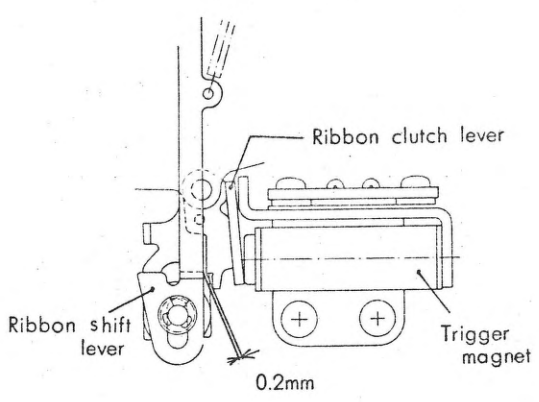
2-14-1 Assembling of ribbon feeding unit

1. Apply G-2 oil to the right and left ribbon feeding pawl shaft of transmitting lever (B5-2), set ribbon feeding pawls G (B5-3) and M (B5-4), then fix them with retaining ring TYPE-E 2.3. 2. Apply G-2 oil to transmitting lever shaft, set transmitting lever assembly (B5-2), then fix it with retaining ring TYPE-E 3. 3. Set exchanging direction lever (B5-5) to transmitting lever shaft, then fix it with retaining ring TYPE-E 3. 4. Hook ribbon feeding pawl spring (B5-7) to three projections of exchanging direction lever assembly (B5-5), and pass it through holes of ribbon feeding pawls G (B5-3) and M (B5-4). 5. Hook exchanging direction spring (B5-6) to ribbon feeding pawl shaft and exchanging direction pin.	* Adjust the curvature of the lever if necessary.
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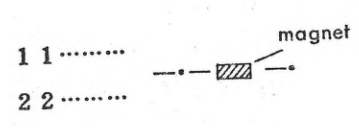
ASSEMBLY PROCEDURES	REMARKS
6. Apply G-2 oil to the right and left detecting lever shaft, then insert hook levers G (B5-14) and M (B5-16) into both shafts. 7. Set detecting lever springs G (B5-11) and M (B5-13) to detecting levers G (B5-10) and M (B5-12), insert them into the right and left detecting lever shaft, then fix it with retaining ring TYPE-E 2.3. 8. Hook detecting lever springs G and M to the projection of basic plate. 9. Hook two hook lever springs (B5-15) to hook lever and spring hook pin of basic plate (right and left). 10. Check if detecting lever and hook lever can rotate lightly (right and left). 11. Apply G-2 oil to the right and left spool shaft, then set spool gears (B5-8) and two brake springs (B5-9) in this order. Then fix them with retaining ring TYPE-E 3. 12. Apply G-2 oil to brake spring and the sliding surface of retaining ring TYPE-E. 13. Check if spool gear rotates smoothly. 14. Check the operation of all parts which rotate or slide. 15. Adjust auto-return of ribbon feeding. Remove ribbon spool. When detecting lever contacts exchanging direction lever, check if the clearance between spool shaft and the part a of detecting lever is within 5 ± 0.3 mm. 16. Mount ribbon guide lever (B5-17) to basic plate. 17. Apply G-2 oil to the contact surface of each lever.	* Be careful not to confuse detecting lever springs G and M. * Set retaining ring TYPE-E with its burr side up. * Be careful not to deform the hooked part of spring. * Set retaining ring TYPE-E with its burr side up. * It is easily mounted by bending basic plate a little upwards. * Refer to VII-1 "Lubricants" R-8 to R-23.

2-14-2 Set of the ribbon mechanism

1. After applying G-2 oil to the extreme end of paper feeding lever guide shaft, set ribbon shift lever, then fix with plane washer 3-0.5-6 and retaining ring TYPE-E 2.3 in this order. 2. Hook ribbon shift spring (B5-22) to ribbon shift lever and the projection of bridge for idler gear. 3. Apply G-2 oil to the hooked part of the spring. 4. Insert driving lever (B5-19) into the driving lever shaft (B4-7). 5. Set ribbon feeding unit (B5-A) by inserting it into the frame, then fix it with two C.P. screws 2.5×6 at 8kg-cm torque. 6. Hook driving lever spring (B5-20) to the Projection under the basic plate and driving lever (B5-19). 7. Apply G-2 oil to the hooked part of the spring. 8. Engage ribbon shift lever (B5-21) with ribbon guide	* Set plane washer and retaining ring TYPE-E with their burr side up. * Place basic plate under the dust cover of paper guide assembly (B4-9) without fail. * Engage transmitting lever (B5-2) with driving lever (B5-19) fully.
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ASSEMBLY PROCEDURES	REMARKS
lever assembly (B5-17). 9. Check if ribbon shifting can be performed firmly and smoothly.  The diagram illustrates the mechanical components involved in ribbon shifting. It shows a ribbon shift lever on the left and a ribbon clutch lever on the right. A trigger magnet is positioned below the clutch lever. A dimension line indicates a clearance of 0.2mm between the actuating plate of the paper feeding rack lever and the trigger magnet.	* Ribbon clutch lever must be positioned so that the clearance between it and ribbon shift lever is about 0.2 mm in actuating condition. If this clearance is smaller, loosen the setscrews of the trigger magnet for paper feeding (B4-1), and adjust its position. In this case, since the clearance between actuating plate of paper feeding rack lever and trigger magnet varies, adjust it to be 0.2mm referring to 2-12.

2-15 Position alignment of print drum

1. Loosen H.F. screw 4×5 which tighten temporarily print drum assembly (B3-5) and set the ferrite magnet of print drum gear with shaft assembly to the middle of characters 1 and 2 on print drum. 2. Adjust finely the position of print drum so that character comes right under hammer just before hammer strikes print drum, and tighten it temporarily with H.F. screw 4×5. 3. Check a print missing, an inclined contact of hammer etc., in practising printing. 4. Apply Loctite over H.D. screw 4×5 and tighten it firmly. 5. Loosen H.F. screw 4×5, apply Loctite, and tighten it again firmly. 6. Make a printing test again.	 The diagram shows a horizontal line representing the print drum with two characters, '1' and '2', marked. A dashed line indicates the position of the magnet, which is aligned between the two characters. A label 'magnet' points to the dashed line. * When trigger magnet assembly for printing (B3-1), hammer lever assembly (B3-5) and print drum assembly (B3-8) are replaced or set, make a printing test to check printing quality.
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2-16 Covers

1. Press print drum cover (B3-8) so that the projection of it to be fitted perfectly into the recesses inside both mes. 2. Put paper cutter lever (B4-11) into paper cutter lever shafts G and M, then push it completely keeping it with the pins on the outside of both frames. 3. Put rubber bushing into motor cover, and tighten it with plane washer 3-0.5-8 and C.P. screw 3×8 at 2 kg·cm torque.	* In case of the paper cutter lever has too much play, bend its tale upwards. * Check if foreign matter sticks on rotor assembly.
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ASSEMBLY PROCEDURES	REMARKS
4. Remove retaining ring TYPE-E of ribbon shift lever shaft, then remove ribbon shift lever (B5-21) from ribbon guide lever (B5-17). 5. Insert rubber bushing (B7-2) into gear cover (B7-1), and tighten it with plane washer 3-0.5-8 and C.P. screw 3×8 at 2 kg·cm torque. 6. Insert ribbon shift lever shaft into ribbon guide lever, then insert retaining ring TYPE-E 2.3 into it. 7. Set tension lever assembly (B4-12) into the slot of basic plate, and set it under paper guide auxiliary plate.	* Set the cover pressing it upwards slightly.

VI PARTS LIST

[1] MODEL-102

- The parts which quantities are parenthized are included in a unit or an assembly, but each part can be ordered separately.
- ★ mark parts are New types. Refer to PARTS PRICE LIST about interchangeability of the parts.
- ★★ mark parts are not used in MODEL-102W.

1. Frame

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B1-1	Frame assembly B	1114120	1	★★

2. Drive components

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B2-1	Motor circuit unit B	1294120	1	★
PW	Plane washer (3-0.5-8)	5002010	(2)	
CP	C.P. screw (3×18)	6032010	(2)	★★
—	Resistor for adjusting motor speed	1.0KΩ 1.2KΩ 1.5KΩ 1.8KΩ 2.0KΩ 2.2KΩ 2.4KΩ 2.7KΩ 3.0KΩ 3.3KΩ 3.6KΩ 3.9KΩ 4.3KΩ 4.7KΩ 5.1KΩ 5.6KΩ	4006010 4007010 4008010 4010010 4011010 4012010 4013010 4014010 4015010 4016010 4017010 4018010 4019010 4020010 4021010 4023010	1
B2-2	Rotor assembly B	1295120	1	★
OW	Outside toothed lock washer (4)	5504010	1	
HN	Hexagon nut (L4)	7204010	1	
B2-3	Ratchet shaft B	1246120	1	
PW	Plane washer (7-0.1-11)	5024010	2	
PW	Plane washer (7-0.2-11)	5023010		
PW	Plane washer (7-0.3-11)	5022010		
PW	Plane washer (7-0.5-11)	5021010		

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B2-4	Miniature bearing with flange (7×14)	9102010	2	
CPB	C.P. bind screw (2×4)	6301010	4	
B2-15	Detecting wheel T assembly	1251120	1	
HC	H.C. screw (4×5)	6501010	1	
B2-6	Print drum gear with shaft assembly C	1288120	1	
LS	Leaf spring (5-0.1)	5401010	1	
PW	Plane washer (5-0.3-10)	5007010	1	★★
RE	Retaining ring TYPE-E (4)	8604010	1	
B2-7	Plane bearing A	9202010	2	★★
CPB	C.P. bind screw (3×3)	6302010	4	
B2-8	Idler gear unit <Including B2-10~11>	1235120	1	
PW	Plane washer (3-0.5-6)	5017010	3	
CP	C.P. screw (3×6)	6004010	3	
B2-10	Ribbon clutch lever spring	1243120	(1)	
B2-11	Idler gear	1240120	(1)	
PW	Plane washer (3-0.2-5)	5025010	(1)	
RE	Retaining ring TYPE-E (2)	8602010	(1)	
B2-16	Detecting head T	1253120	1	
PW	Plane washer T	1263120	1	
CP	C.P. screw (3×6)	6004010	2	
B2-17	Detecting head R	1254120	1	
PW	Plane washer R	1264120	1	
CP	C.P. screw (3×6)	6004010	2	
—	Capacitor 0.68μF	1260120	1	
B2-13	Connector with wirers B	1259120	1	★★
B2-14	Wires holding clip	1223120	1	
PW	Plane washer (3-0.5-8)	5002010	1	
CP	C.P. screw (3×8)	6005010	1	

3. Printing components

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B3-1	Trigger magnet assembly for printing <Including diodes>	1301120	2	★★
PW	Plane washer (3-0.5-8)	5002010	4	
CPS	C.P. screw with spring lock washer (3×6)	6016010	4	★★

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
—	Diode	4202010	(18)	
B3-2	Actuating lever assembly <Including B3-2-2>	1316120	1	★★
PW	Plane washer (4-0.8-10)	5005010	(1)	
SW	Spring lock washer (4)	5304010	(1)	
HN	Hexagon nut (4)	7104010	(1)	
B3-2-2	Paper feeding lever guide shaft	1319120	(1)	
B3-3-1	Trigger lever	1321120	18	+2(for102W)
B3-4	Trigger lever spring	1322120	18	+2(for102W)
B3-5	Hammer lever unit <Including B3-6>	1327120	1	★★
PW	Plane washer (4-0.8-10)	5005010	(2)	
SW	Spring lock washer (4)	5304010	(2)	
HN	Hexagon nut (4)	7104010	(2)	
SP	Spring pin (2×6)	8005010	2	
B3-6	Hammer lever spring	1333120	(18)	(+2)(for 102W)
B3-7	Print drum assembly	—	1	★★
HD	H.D. screw (4×5)	6701010	1	★★
HF	H.F. screw (4×5)	6601010	1	★★
B3-8	Print drum cover assembly <Including 3-8-1>	1341120	1	
B3-8-1	Roll in protection lever	1444120	(1)	★★

4. Paper feeding components

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B4-1	Trigger magnet assembly for paper feeding	1434120	1	
PW	Plan washer (3-0.5-8)	5002010	2	
CPS	C.P. screw with spring lock washer (3×6)	6016010	2	
—	Diode	4202010	(2)	
B4-2	Paper-feeding lever unit B <Including B4-3, B4-5>	1453120	1	★
PW	Plane washer (5-0.3-10)	5007010	1	
RE	Retaining ring TYPE-E (4)	8604010	1	
B4-3	Paper feeding rack lever spring B	1454120	(1)	★
B4-5	Paper feeding click spring	1415120	(1)	
B4-6	Paper feeding spring	1417120	1	

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B4-7	Driving lever shaft	1416120	1	
B4-8 RE	Paper feeding roller unit B<Including B4-8-2> Retaining ring TYPE-E (4)	1455120 8604010	1 2	
B4-8-2 SP	Paper feeding ratchet wheel Spring pin (1.6×8)	1403120 8004010	(1) (1)	
B4-8-3	Plane bearing B	9203010	1+(1)	
B4-8-4	Stopper ring	1452121	(1)	★
B4-9	Paper guide assembly C	1419122	1	★★
B4-10	Paper holding roller B	1424120	1	
B4-11	Paper cutter lever assembly A	1425120	1	★★
B4-12	Paper tension lever assembly C	1430122	1	★★
B4-13	Paper tension spring C	1433122	1	★

5. Ribbon feeding components

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B5-A CP	Ribbon feeding unit B <Including B5-1~16> C.P. screw (2.5×6)	1501121 6010010	1 2	★
B5-1	Basic plate assembly B	1502121	(1)	★
B5-2 RE	Transmitting lever assembly Retaining ring TYPE-E (3)	1508120 8603010	(1) (1)	
B5-3 RE	Ribbon feeding pawl G Retaining ring TYPE-E (2.3)	1511120 8623010	(1) (1)	
B5-4 RE	Ribbon feeding pawl M Retaining ring TYPE-E (2.3)	1512120 8623010	(1) (1)	
B5-5 RE	Exchanging direction lever assembly Retaining ring TYPE-E (3)	1513120 8603010	(1) (1)	
B5-6	Exchanging direction spring	1516120	(1)	
B5-7	Ribbon feeding pawl spring	1517120	(1)	

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B5-8 RE	Spool gear Retaining ring TYPE-E (3)	1518120 8603010	(2) (2)	
B5-9	Brake spring	1519120	(4)	
B5-10 RE	Detecting lever G Retaining ring TYPE-E (2.3)	1521120 8623010	(1) (1)	
B5-11	Detecting lever spring G	1523120	(1)	
B5-12 RE	Detecting lever M Retaining ring TYPE-E (2.3)	1522120 8623010	(1) (1)	
B5-13	Detecting lever spring M	1524120	(1)	
B5-14	Hook lever G	1525120	(1)	
B5-15	Hook lever spring	1527120	(2)	
B5-16	Hook lever M	1526120	(1)	
B5-17	Ribbon guide lever assembly C <Including B5-18>	1533121	1	
B5-19	Driving lever	1539120	1	
B5-20	Driving lever spring	1540120	1	
B5-21 PW RE	Ribbon shift lever assembly Plane washer (3-0.5-8) Retaining ring TYPE-E (2.3)	1541120 5002010 8623010	1 1 2	
B5-22	Ribbon shift spring	1544120	1	
B5-23	Black-and-red ribbon with spool	1545120	1	

6. Cover

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B7-1 PW CP	Gear cover C Plane washer (3-0.5-8) C.P. screw (3×8)	1257120 5002010 6005010	1 2 2	★★
B7-3 PW CP	Motor cover C Plane washer (3-0.5-8) C.P. screw (3×8)	1256120 5002010 6005010	1 2 2	★★
B7-2	Rubber bushing	1275010	4	

Note

CP : Cross-recessed head machine screw (Pan head)
 CPB : Cross-recessed head machine screw (Bind screw)
 CPS : C.P. screw with spring lock washer
 CF : Cross-recessed head machine screw (Flat head)
 HF : Hexagonal socket headless setscrew (Flat point)
 HC : Hexagonal socket headless setscrew (Cone point)
 HD : Hexagonal socket headless setscrew (Double point)
 PW : Plane washer
 OW : Outside toothed lock washer
 IW : Inside toothed lock washer
 SW : Spring lock washer
 HN : Hexagon nut
 LS : Leaf spring
 RE : Retaining ring TYPE-E
 SP : Spring pin

[2] Particular parts for MODEL-102W

1. Frame

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B1-1	Frame Assembly #102W	1117120	1	

2. Drive components

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B2-7	Plane bearing #102W	9206010	2	
B2-13	Connector with wires #102W	1201180	1	
PW	Plane washer for print drum gear with shaft assembly C (5-0.1-10)	5046010	1	
CP	C.P. screw for motor circuit unit (3×16)	6022010	(2)	

3. Printing components

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B3-1	Trigger magnet assembly for printing #102W (including Diodes)	1343120	2	
CPS	C.P. Screw with spring lock washer (3×5)	6030010	4	
B3-2	Actuating lever assembly #102W	1312180	1	

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B3-5	Hammer lever unit #102W (including B3-6)	1342120	1	
B3-7	Print drum assembly #102W	—	1	
HD	H.D screw 3×5	6704010	2	
HF	H.F screw 3×5	6605010	(1)	For temporary tightening

4. Paper feeding components

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B4-9	Paper guide assembly #102W	1456120	1	
B4-11	Paper cutter lever assembly #102W	1457120	1	
B4-12	Paper tension lever assembly #102W	1502180	1	

6. Cover

NUMBER IN FIG.	PARTS NAME	PARTS NO.	QUANT.	REMARKS
B7-1	Gear cover #102W	1204180	1	
B7-3	Motor cover #102W	1205180	1	

VII ANNEX

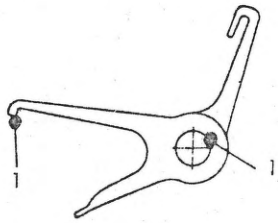
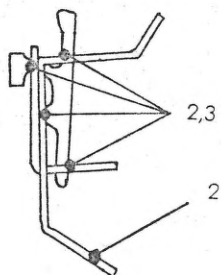
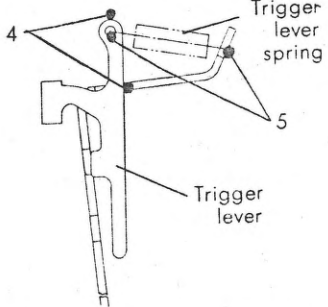
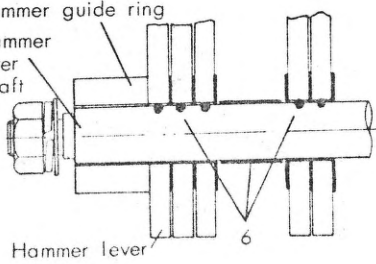
1. Lubricants

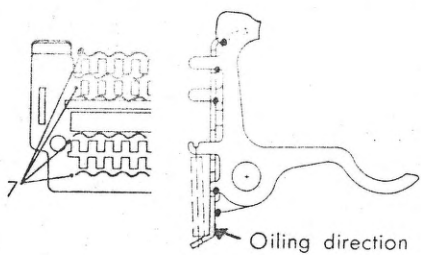
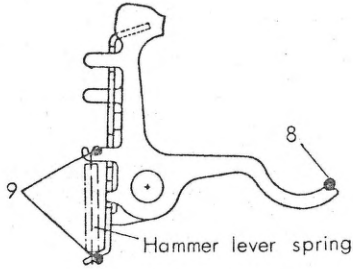
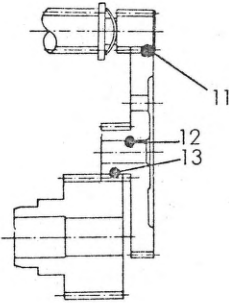
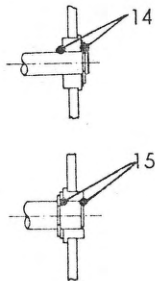
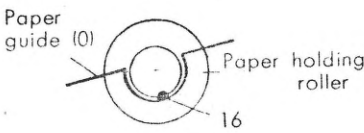
The oils used in this printer are G-2 and 0-2.

To increase efficiency of the lubricating oil, all parts must be cleaned thoroughly before they are lubricated.

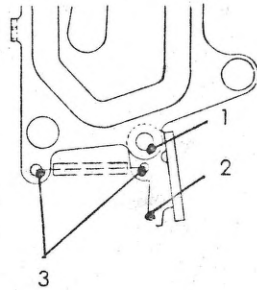
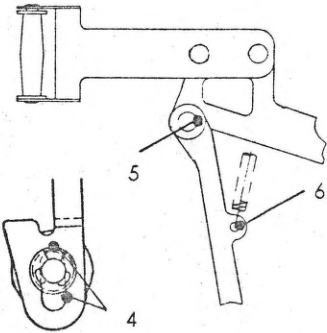
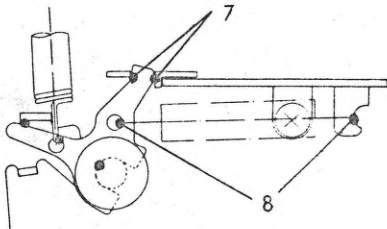
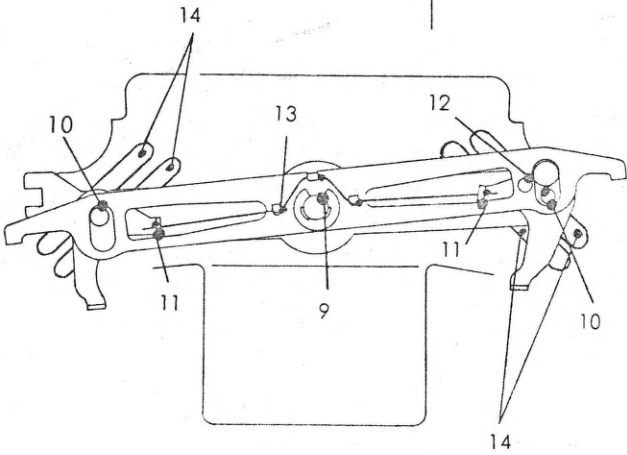
For lube positions and the kinds of lubricants to be used, refer to the list.

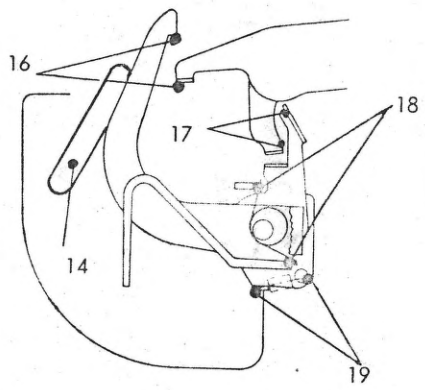
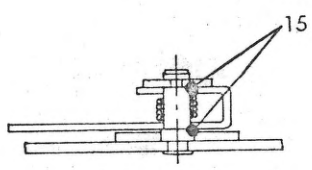
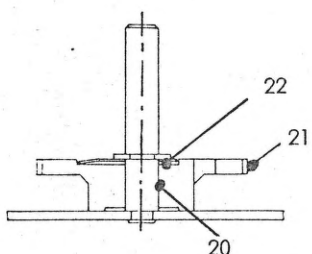
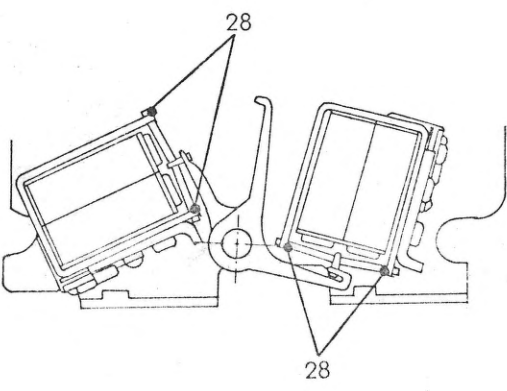
CAUTION: Do not apply oil to the ball bearing.

NO.	PARTS	LUBRICANT USED	LUBE POSITION	REMARKS
M-1.	Actuating lever assembly	G-2	 On shaft and contact face with the trigger lever	Lubricate before fixing to frame assembly.
-2.	Actuating lever guide	G-2		
-3.	Trigger lever guide	G-2		
-4.	Trigger lever	G-2		Lubricate after fixing to frame assembly.
-5.	Trigger lever spring	G-2		
-6.	Hammer lever unit shaft	G-2		On shaft and all contact surfaces with next hammer lever.

NO.	PRATS	LUBRICANT USED	LUBE POSITION	REMARKS
M-7.	Hammer guide	G-2		Lubricate before assembling with the hammer.
-8.	Hammer lever unit	G-2		
-9.	Hammer lever spring	G-2		
-10.	Ratchet shaft (pawl part)	G-2	Apply grease over entire pawl	
-11.	Ratchet shaft	G-2		Lubricate on the idler gear before assembling into bridge for idler gear assembly.
-12.	Idler gear	G-2		
-13.	Print drum gear	G-2		
-14.	Plane bearing A	O-2		Lubricate while moving the shaft right and left.
-15.	Plane bearing B	O-2		
			On right and left points respectively	
-16.	Paper guide	G-2		

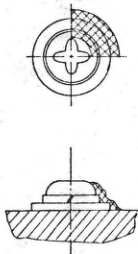
NO.	PARTS	LUBRICANT USED	LUBE POSITION	REMARKS
M-17.	Paper feeding ratchet wheel	G-2		
-18.	Paper feeding ratchet shaft	G-2		
-19.	Paper feeding rack lever shaft	G-2		
-20.	Paper feeding roller shaft. Paper feeding lever (operating part)	G-2		
-21.	Paper feeding lever guide shaft. Paper feeding lever (operating part)	G-2		
-22.	Driving lever shaft (slot part)	G-2		
-23.	Paper feeding rack lever (R part)	G-2		
-24.	Paper feeding lever. Driving lever (contact part)	G-2		
-25.	Paper feeding rack lever spring	G-2		
-26.	Paper feeding click spring	G-2		
-27.	Paper feeding spring	G-2		Only on the hooked part of the spring.

NO.	PARTS	LUBRICANT USED	LUBE POSITION	REMARKS
R-1.	Ribbon clutch lever shaft	G-2		
-2.	Contact part between ribbon clutch lever and ribbon shift lever	G-2		
-3.	Ribbon clutch lever spring (hooked part)	G-2		
-4.	Operating part between ribbon shift lever and paper feeding lever guide shaft	G-2		
-5.	Ribbon shift lever shaft	G-2		
-6.	Ribbon shift spring (hooked part)	G-2		
-7.	Contact part between driving lever and transmitting lever	G-2		
-8.	Driving lever spring (hooked part)	G-2		
-9.	Transmitting lever shaft	G-2		
-10.	Ribbon feeding pawl shaft (two parts)	G-2		
-11.	Contact part between ribbon feeding pawls G, M and exchanging direction lever	G-2		
-12.	Exchanging direction spring (hooked part)	G-2		
-13.	Ribbon feeding pawl spring (hooked part)	G-2		
-14.	Basic plate assembly (reinforcement part)	G-2		

NO.	PARTS	LUBRICANT USED	LUBE POSITION	REMARKS
R-15.	Detecting lever shaft (two points)	G-2		
-16.	Contact part between detecting lever and ex- changing direction lever (two points)	G-2		
-17.	Contact part between hook lever and ribbon feeding pawl G, M (two points)	G-2		
-18.	Detecting lever spring (hooked part) (two points)	G-2		
-19.	Hook lever spring (hooked part) (two points)	G-2		
-20.	Ribbon spool shaft (two points)	G-2		
-21.	Spool gear (two points)	G-2		
-22.	Contact part between brake spring and retaining ring TYPE-E (two points)	G-2		
-23.	Inserting hole for ribbon guide lever shaft (two points)	G-2	On the hole of basic plate	
M-28	Trigger magnet assembly for printing	G-2		

2. Adhesives

When parts are reassembled, use the adhesives specified to prevent parts and screws from loosening.

NO.	PARTS	ADHESIVE	REMARKS
1	Setscrwes for print drum assembly H.D. screw, H.F. screw	Loctite	Apply it to about 4 screw threads from the tip.
2	Setscrew for detecting wheel T H.C. screw	Loctile	Apply it to about 4 screw threads from the tip.
3	Setscrews for miniature bearing C.P. bind screw (4 points)	Loctite	Apply it to about 3 screw threads from the tip.
4	Driving lever shaft (screw part)	Loctite	Apply it to about 3 screw threads from the tip.
5	Setscrews for plane bearing A C.P. bind screw (4 points)	Loctite	Appoly it to about 3 screw threads from the tip.
6	Other screws and nuts	Neji Lock #2	Apply it to over 1/4 of screw head and washer. Be careful not to apply it into cross recess. 
7	Rubber damper on hammer lever guide	Cemedine Con- tact	
8	Urethane damper on tension lever	Cemedine con- tact	

3. Standard Tools, Oils and Adhesives List for MODEL-104

3-1 Tools

NO.	NAME	STANDARD	MARKETING	REMARKS
T-1	Torque driver	26 kg·cm max.	◎	Common use for EP-101 and MODEL-104
T-1-1	(-) bit		◎	
T-1-2	(+) bit #2		◎	
T-1-4	Box bit		◎	
T-2	Soldering iron		○	
T-3	Torque wrench	Width 7 mm, 24 kg·cm	◎	
T-4	Long nose plier	Length 15 cm	○	
T-5	Diagonal cutting nipper	Length 15 cm	○	
T-6	Hexagonal wrench	1.9 mm	○	
T-10	Tweezers	MM	○	
T-11	File	150 mm	○	
T-12	Whet stone	100×9.5□ mm	○	
T-13	Open handed spanner	7 mm	○	
T-14	Brush for lubrication #1		○	
T-15	Brush for lubrication #2		○	
T-16	Brush for cleaning	Width 15 mm	○	Common use for MODEL-104
T-8	Retaining plier #2.5	ETH 2.5	○	
T-34	Retaining plier #2	ETH 2	○	
T-35	Retaining plier #3	ETH 3	○	
T-24	Retaining plier #4	ETH 4	○	Exclusive use for MODEL-102
T-26	Diamond wheel #102		☆	
T-25	Gear driver #102		☆	
T-27	Connector for timing adjustment #102		☆	
T-28	Connector for checking contact position #102		☆	

3-2 Oils, Adhesives

KINDS	NAME	CAPACITY	MARKETING
Oil	O-2	40 cc	☆
Grease	G-2	40 gr	☆
Adhesive	Neji Lock #2	1,000 gr	○
	Loctite	10 cc	○
	Cemedine Contact	20 cc	○

MARKETING

○: On the market

◎: On the market on special order

☆: Exclusive